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Fishery Data from the Anderson River Estuary, Northwest Territories, 1990

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Central and Arctic Region
Department of Fisheries and Oceans
Winnipeg, Manitoba R3T 2N6

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by

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ABSTRACT

Bond, W.A., and R.N. Erickson. 1992. Fishery data from the Anderson River estuary, Northwest Territories, 1990. Can. Manusc. Rep. Fish. Aquat. Sci. 2171: vi + 46 p.

Monitoring of the fish community within the estuary of the Anderson River, Northwest Territories, was conducted for the second consecutive summer. Shore-based trap nets were operated continuously from 1 July to 25 August 1990 at two sites located farther from the mouth of the Anderson River than was the case in 1989. Five coregonid species accounted for 39.8% of the total catch. These included *Coregonus sardinella* (least cisco), *C. autumnalis* (Arctic cisco), *C. clupeaformis* (lake whitefish), *C. nasus* (broad whitefish), and *Stenodus leucichthys* (inconnu), which represented 60.4, 17.2, 13.3, 5.8, and 1.9%, respectively, of all coregonids captured. Arctic flounder (*Pleuronectes glacialis*) was the most common marine species contributing 41.6% of the total catch. This report summarizes daily catch data for each of the 22 species captured. For the coregonid species, data on length-frequency distribution, age and growth features, sex ratios, and state of maturity are also included. Additionally, data are presented on water temperatures, salinity, and water levels encountered in the estuary during the summer.

Key words: Beaufort Sea; anadromous species; life history; migrations; Arctic cisco; *Coregonus autumnalis*; least cisco; *Coregonus sardinella*; broad whitefish; *Coregonus nasus*; lake whitefish; *Coregonus clupeaformis*; inconnu; *Stenodus leucichthys*; marine fish.

RÉSUMÉ

Bond, W.A., and R.N. Erickson. 1992. Fishery data from the Anderson River estuary, Northwest Territories, 1990. Can. Manusc. Rep. Fish. Aquat. Sci. 2171: vi + 46 p.

Une surveillance de la communauté de poissons dans l'estuaire de la rivière Anderson, dans les territoires du Nord-Ouest, a été réalisée pour une deuxième année consécutive. Des filets-trappes situés près de la rive ont été utilisés de manière continue du 1^{er} juillet au 25 août 1990 en deux endroits situés plus en amont de l'embouchure de la rivière Anderson qu'en 1989. Cinq espèces de corégonidés ont constitué plus de 39,8% des prises totales, à savoir *Coregonus sardinella* (cisco sardinelle), *C. autumnalis* (cisco arctique), *C. clupeaformis* (grand corégone), *C. nasus* (corégone tschir) et *Stenodus leucichthys* (inconnu) qui représentaient respectivement 60,4, 17,2, 13,3, 5,8 et 1,9% de tous les corégonidés capturés. La plie arctique (*Pleuronectes glacialis*) s'est révélée l'espèce marine la plus fréquente, représentant 41,6% des prises totales. On trouvera dans le présent rapport un sommaire des données sur les prises quotidiennes pour chacune des 22 espèces capturées. Dans le cas des espèces de corégonidés, le rapport fournit en plus les données suivantes : distribution des fréquences de longueur, âge et caractéristiques de croissance, sex-ratios et état de maturité. En outre, on y trouvera des données sur la température, la salinité et le niveau de l'eau dans l'estuaire au cours de l'été.

Mots clés : Mer de Beaufort; espèces anadromes; cycle vital; migrations; cisco arctique; *Coregonus autumnalis*; cisco sardinelle; *Coregonus sardinella*; corégone tschir; *Coregonus nasus*; grand corégone; *Coregonus clupeaformis*; inconnu; *Stenodus leucichthys*; poissons marins.

INTRODUCTION

The Arctic cisco (*Coregonus autumnalis*) is an anadromous coregonid that spawns in the Mackenzie River and forages along the Beaufort Sea coast during the summer months. To date, most information relevant to the life history of Arctic cisco has come from fisheries studies in the Mackenzie River or west along the Yukon/Alaska coast (Stein et al. 1973; Craig and Mann 1974; Kendel et al. 1975; Moulton et al. 1985; Cannon et al. 1987; Bond and Erickson 1987, 1989; and others). Arctic cisco are also known to migrate eastward from the Mackenzie River along the coast of the Tuktoyaktuk Peninsula (Jones and den Beste 1977; Bond 1982; Lawrence et al. 1984; LGL 1989). However, the extent and periodicity of these eastward migrations are not well understood. Arctic cisco also occur in Liverpool Bay (Bray 1975; Gillman and Kristoferson 1984), but the relationship of these fish to Mackenzie stocks has not been clarified. The general lack of information on the distribution and abundance of Arctic cisco to the east of the Mackenzie, and particularly on the significance of the Liverpool Bay area to Mackenzie River stocks, represents a major gap in our understanding of this important species.

The current study was initiated in 1989 to address the need for information on the status of Arctic cisco in habitats located east of the Mackenzie River. The objectives of the study are to: 1) determine whether major rearing/ overwintering of juvenile Arctic cisco from the Mackenzie River occurs east of the Mackenzie Delta; 2) identify specific areas to the east of the Mackenzie Delta that may be critical to the maintenance of Mackenzie River stocks; and 3) quantify the significance of such eastern locations to Mackenzie River populations. Results of the first year's work (1989) have been described by Bond and Erickson (1991). The present report summarizes results obtained in 1990, the second year of the study. As in the previous year, the specific objective for 1990 was to monitor and describe the coastal migrations of Arctic cisco in Wood Bay near the mouth of the Anderson River.

Although the initial focus was on Arctic cisco, this study has placed equal emphasis on several other coregonid species encountered in Wood Bay. These include least cisco (*C. sardinella*), broad whitefish (*C. nasus*), lake whitefish (*C. clupeaformis*), and inconnu (*Stenodus leucichthys*). Other species have been dealt with in less detail.

STUDY AREA

Wood Bay (69°45'N, 129°00'W) is located 175 km east of Tuktoyaktuk, Northwest Territories, and is part of the Liverpool Bay system (Fig. 1). Recognized as a rich fishing area, it was once the site of a Roman Catholic mission which operated at Stanton (Fig. 2) from 1937 to 1954 (Abrahamson 1968). The bay has a total surface area of approximately 350 km², of which 80% lies within the 5 m isobath. Although influenced by the Mackenzie River, Wood Bay receives most of its fresh water from the Anderson River (Fig. 2), which drains an area of 60 000 km² and delivers a total annual discharge of 2×10^6 to 8×10^6 dam³ to the southern end of the bay. The smaller Mason River enters Wood Bay at its north end (Fig. 2). Ice-out on the Anderson River occurs in May, contributing to the clearing of ice from the inner part of Wood Bay by mid-June. Ice may persist in the northern half of Wood Bay until late June, and in Liverpool Bay until mid-July. As river flows diminish following the spring flood, saline water encroaches into Wood Bay from the north, although temperature and salinity patterns in the bay are strongly influenced throughout the summer by winds and by rain events in the Anderson River watershed. Because it is so shallow, most of Wood Bay undoubtedly freezes to the bottom in winter. However, because the Anderson River flows throughout the winter, pockets of fresh water likely persist beneath the ice, a feature of considerable significance to anadromous fish in a region where winter habitat is severely restricted (Craig 1989).

MATERIALS AND METHODS

FIELD METHODS

Physical and chemical

Environmental parameters measured during this study included water temperature, salinity, and water level. Water temperature and salinity were determined at each trap check as well as at Station 501 (Fig. 2) from 17 June to 29 August. Water temperatures were measured ($\pm 0.5^\circ\text{C}$) using a hand-held pocket thermometer. Water samples for salinity analysis were taken in 1 L Nalgene bottles and transported directly to the field laboratory where salinity ($\pm 0.1\text{g} \cdot \text{kg}^{-1}$) was determined using a YSI Model 33 salinity meter. Continuous water level readings were obtained from an Ottoboro tide gauge established near Station 501. Tapes from the tide gauge were analyzed by staff of the Tides and Current Sec-

tion, Institute of Ocean Sciences, Department of Fisheries and Oceans, Sidney, BC. Air temperatures for the study period (Nicholson Point data) were obtained from the Edmonton office of the Department of the Environment, Atmospheric Environment Service.

Trap net sampling

The sampling gear consisted of a double codend trap with a single 45.6 m lead extending perpendicularly to the shoreline and two 15.2 m wings set at 45° angles to the lead. Identical gear has been utilized in numerous recent studies on the Beaufort Sea coast (Moulton et al. 1985; Cannon et al. 1987; Bond and Erickson 1989; LGL 1989; Palmer and Dugan 1990). The funnel mouth leading to each codend trap was supported by a stainless steel frame 1.7 m high by 1.8 m wide. Traps were 3.7 m long and 0.9 m on a side, contained five internal stainless steel frames and two throats (15 x 25 cm), and were constructed of 1.27 cm dark grey #147 knotless nylon mesh. Wings and leads were made of 2.54 cm dark grey #63 knotless nylon. Traps, leads, and wings were equipped with zippers, installed in such a way that they could be attached in any combination. Wings and leads were both 1.7 m deep and built in 15.2 m sections.

Two stations (503 and 504) were established on the east coast of Wood Bay in 1990 (Fig. 2). These were situated north of the 1989 sites (501 and 502), thus removing them from the immediate influence of the Anderson River and placing them in a more transitional area in terms of temperature and salinity. Fishing began on 30 June at Station 504 and on 1 July at Station 503 and continued until 25 August. Traps were usually checked daily. On each occasion trapped fish were removed from the codend to a floating holding pen for processing and the trap was reset immediately. Total fishing effort was approximately 55 net-days at Station 503 and 56 net-days at Station 504 (Table 1).

All trapped fish were identified to species and counted but length measurements (fork length (FL) ± 1.0 mm) were taken only for the coregonids. In the case of inconnu, virtually all fish were measured. For the other coregonid species, separate counts and measurements were done for a maximum of 50 small and 30 large fish per codend per day. The division between large and small fish was made at 150 mm for Arctic cisco, broad whitefish, and lake whitefish and at 180 mm for least cisco. Ratios from these sub-

samples were applied to total counts of large and small fish and the results combined to produce length-frequency descriptions of the total catch. Small numbers of each coregonid species were sacrificed for biological analysis. Numbered Floy anchor tags (Type FD-68B) were applied to some large Arctic cisco in hopes of obtaining information on the geographical extent of movement of individual fish.

Gillnet sampling

Variable mesh gill nets were used to monitor for the presence of Arctic cisco prior to trap installation (17-30 June) and to check for the presence of fish in offshore waters of Wood Bay. Gill nets were 60 m long by 1.8 m deep and consisted of equal lengths of 3.8, 5.1, 6.4, 7.6, 8.9, and 10.2 cm braided nylon mesh (stretch measure) seamed together. A total of 23 shoreline sets and 13 offshore sets were made during the period 17 June-28 August, with soak times ranging from 60 to 355 minutes (Table A1). All gill netted fish were retained for biological analysis.

LABORATORY METHODS AND DATA ANALYSIS

Ten of the fish species captured in the trap nets were considered sufficiently important to warrant some level of analysis. These included the five coregonid species, Arctic flounder, rainbow smelt, Pacific herring, fourhorn sculpin, and saffron cod.

Catch-per-unit-effort

The catch-per-unit-effort (CPUE) for each species was calculated as the number of fish captured per day (24 h) in each codend trap. Separate CPUE determinations were made for large and small Arctic cisco, least cisco, broad whitefish, and lake whitefish. Station CPUE's, the sums of the CPUE values for the individual codends, were pooled by weekly cycles for graphing to eliminate short-term fluctuations and emphasize seasonal trends. Inclusive dates for the sampling cycles referred to in the text are presented in Table 1.

Length-frequency distribution

The length-frequency distribution for each coregonid species was determined by weekly sampling period for each codend trap at each station. For purposes of this report, length-fre-

quencies are presented for the total sample, for each sampling station, and by weekly intervals in order to demonstrate temporal changes.

Biological analysis

Samples of each coregonid species were retained for more complete biological evaluation. These samples were not selected randomly from the catch, but rather were chosen to ensure representation across the full size ranges of fish occurring in the trap net catches. For these fish, fork length (± 1.0 mm) was recorded and body weight (± 1.0 g) was determined using an electronic balance. Sex was determined by examination of the gonads and a qualitative description of the degree of gonadal development was applied according to the following scale:

<u>Female</u>	<u>Male</u>	
1	6	Immature
2	7	Maturing
3	8	Mature
4	9	Ripe
5	10	Spent
0		Sex Indistinguishable

To provide a more quantitative assessment of the degree of sexual development, gonads were removed from the fish and weighed fresh (± 1.0 g). The data on body and gonad weight were then used to calculate the gonadosomatic index (GSI) by the formula:

$$\text{GSI} = (\text{gonad weight} \times 100) \cdot \text{fish round weight}^{-1}.$$

Scales and sagittal otoliths were retained for age determination. Scales were employed primarily to age young specimens (<6 years) and to assist in the interpretation of otoliths. Otolith ages were determined by the break and burn method (Barber and McFarlane 1987).

Weight-length relationships for each coregonid species were described by the power equation:

$$\log_{10} W = a + b(\log_{10} L)$$

where W = weight (g)
 L = fork length (mm)
 a = y-intercept
 b = slope of the regression line

Relative condition factors (K) were determined from the formula:

$$K = (W \times 10^5) \cdot L^{-3}$$

where W = weight (g)
 L = fork length (mm).

RESULTS

PHYSICAL AND CHEMICAL

Breakup of the Anderson River occurred during the last week of May, 1990 and apart from a brief increase in mid-July (Cycle 3), discharge decreased steadily over the period of our study (Fig. 3). Maximum daily air temperatures recorded at Nicholson Point varied from 1 to 27°C with weekly mean maxima ranging from 21.1°C during Cycle 1 to 3.4°C in Cycle 8 (Fig. 4). Day-to-day changes in daily maximum air temperature were $\pm 5^\circ\text{C}$ on 13 occasions (23% of the time).

A tide gauge was operated at Wood Bay from 21 June to 1 September 1990. However, owing to silt buildup within the unit, data for the period 24 July - 22 August were not suitable for processing.

The overall variation in water level recorded during the summer was 132 cm, with instantaneous values ranging from 15 cm below datum on 26 August to 117 cm above datum on 27 August (Fig. 5). Daily water levels fluctuated within a range of 13 to 113 cm, with a mean variation of 48 cm.

Water temperatures decreased and salinity increased with increasing distance from the mouth of the Anderson River. Water temperatures (Fig. 6) ranged from 4.0 to 21.0°C at Station 501, from 4.5 to 16.5°C at Station 503, and from 4.0 to 16.0°C at Station 504. At all locations, water temperatures peaked during Cycle 3 (15-21 July), then trended downward through the remainder of the study period. In terms of salinity (Fig. 7), values recorded at Station 501 ranged from 0.0 to 12.9 g · kg⁻¹ while at Station 503 and Station 504 values ranged from 0.2 to 20.6 g · kg⁻¹ and 1.2 to 20.9 g · kg⁻¹, respectively. Water temperature and salinity usually differed only slightly between Stations 503 and 504 and similar seasonal patterns were observed at these two locations for both parameters.

TRAP NET RESULTS

Complete daily catch summaries by sampling station and side of net are presented in Tables A2.1 to A2.10 for each of the key species. Separate break-downs are provided for large and small least and Arctic cisco. Daily catches by station for the fourteen minor species are given in Tables A3.1 and A3.2. Tables A4.1 to A4.10 contain length-frequency data for the five coregonid species by sampling cycle and side of trap for each station.

Species composition

The 1990 trap netting study in Wood Bay produced 22 fish species representing 11 families (Table 2). The total combined catch of 97 534 fish included seven anadromous species (51.4%), eight marine species (48.5%), and seven typically freshwater forms (0.1%)(Table 3). Five coregonid species made up 77.5% of all anadromous fish and 39.8% of the total catch. Coregonids contributed from 7.8 to 45.6% of the weekly catch at Station 503 and from 11.2 to 77.9% at Station 504 (Table 4). Among the coregonids, least cisco predominated (60.4%), followed by Arctic cisco (17.2%), lake whitefish (13.3%), broad whitefish (5.8%), and inconnu (1.9%).

Some inter-station differences in species composition and CPUE were observed in 1990 (Tables 5 and 6). For example, CPUE tended to be higher at Station 503 for large broad whitefish, small lake whitefish, rainbow smelt, and saffron cod, while small least cisco, large and small Arctic cisco, and Arctic flounder were more abundant at Station 504. These differences do not appear to be related to temperature or salinity which were similar at the two sampling sites.

During 1989, we identified several coregonids in Wood Bay as possible hybrid forms. Subsequent morphological, meristic, and genetic analyses have confirmed the occurrence of crosses involving all five coregonid species (Reist et al. 1992). In 1990, we attempted to quantify the occurrence of hybrid coregonids in trap net catches. As a result, a total of 519 fish (1.3% of all coregonids captured) were identified in the field as potential hybrids (Table 3). A number of these fish were sent to Dr. J.D. Reist for confirmation of their hybrid status. Analysis of these samples has not yet been completed.

Arctic cisco

Size distribution and seasonal abundance:

Based on 4424 measurements, fork lengths of Arctic cisco trap netted in Wood Bay during 1990 varied from 53 to 474 mm, although most were either less than 150 mm (34%) or more than 300 mm (51%) (Fig. 8). Small individuals (< 150 mm) accounted for 19% of Arctic cisco taken at Station 503 and 42% at Station 504. The relative abundance of small and large Arctic cisco differed from 1989 when small individuals made up 76% of the overall catch and 92% at Station 501. Seasonal changes in the length-frequency distribution of Arctic cisco during 1990 are shown in Fig. 9.

Large fish (≥ 150 mm) accounted for 66% of the total Arctic cisco catch with overall catch rates tending to be higher at Station 504 (48 fish \cdot d⁻¹) than at Station 503 (33 fish \cdot d⁻¹) (Table 6). These rates were similar to that reported in 1989 from Station 502 (37 fish \cdot d⁻¹) and much higher than the rate of 8 fish \cdot d⁻¹ recorded at Station 501. A rapid increase in CPUE for large Arctic cisco during the final week, to 83 fish \cdot d⁻¹ at Station 503 and to 132 fish \cdot d⁻¹ at Station 504, is thought to represent the start of the return migration toward the Anderson River (Fig. 10). The seasonal trends displayed by large Arctic cisco (Fig. 10) are directly attributable to changes in the abundance of individuals in the 300-409 mm size range which dominated this group (74%). Fish of this size were particularly abundant in late summer, accounting for 78% of the total species catch during the final five weeks of the study (Fig. 9).

As in 1989, small Arctic cisco were abundant only in early summer (Fig. 11). Of all small cisco captured in 1990, 90% were taken in the first three weeks of our study (1-21 July) and during this period, fish < 150 mm accounted for 74% of the total species catch. The high catch rates recorded at Station 504 in Cycle 1 (125 fish \cdot d⁻¹) and Cycle 3 (109 fish \cdot d⁻¹) were attributable to age 1 (90-119 mm) and to a lesser degree to age 2 fish (140-159 mm); i.e., to members of the 1989 and 1988 year-classes. The reason for the large discrepancy in CPUE values between the two sampling locations is uncertain but may be related to the greater turbulence experienced at Station 503 than at the more protected Station 504. The difference cannot be attributed to salinity which remained similar at the two locations throughout the study (Fig. 7).

The abundance of age 1 fish in 1989 Bay catches was regarded as evidence that large numbers of age 0 fish of the 1988 year-class had overwintered in the Anderson River (Bond and Erickson 1991). Catches of age 0 cisco (50-69 mm) were not large in 1989, although their appearance did produce minor abundance peaks in the CPUE graphs in late July and early August. In 1990, age 0 Arctic cisco began to appear in the traps on 3 August (Cycle 5) (Fig. 9), but this age-group was poorly represented as total catch did not exceed 100 individuals.

Age and growth: Otolith age estimates for Arctic cisco captured in Wood Bay during 1990 ranged from 0 to 24 years (Table 7). Age 2 fish were better represented in 1990 than in 1989, emphasizing the strength of the 1988 year-class. The length-frequency distribution (Fig. 8) shows a gap between 170 and 299 mm, indicating poor representation of age-groups 3 to 6. Most large fish (330-399) ranged in age from 8 to 13.

The mathematical relationship between fork length and body weight (Table 8) for Arctic cisco taken in Wood Bay during 1990 is described by the equation:

$$\log_{10} W = 3.2485 (\log_{10} L) - 5.6336$$

Sex and maturity: As was the case in 1989, female Arctic cisco outnumbered males in our 1990 samples, accounting for 68% of fish for which sex was determined ($n=249$). The male:female sex ratio of 0.47 differed significantly from unity ($X^2=31.81$; $P<0.005$). Among cisco that were of potential spawning size, females made up 69%. The size used to define potential spawners in 1990 was reduced to 330 mm from 350 mm (Bond and Erickson 1991) based on our field observations. In the Mackenzie River, more than 98% of spawners exceed 330 mm in fork length (Stein et al. 1973; Hatfield et al. 1972).

Most Arctic cisco captured were either juveniles or mature non-spawners. Overall, only 3.8% of males and 18.9% of females examined were considered capable of spawning in 1990. Among fish ≥ 330 mm ($n=200$), 22.5% of females and 4.8% of males were determined to be current-year spawners. Current-year spawners were most common in early summer; only three such fish were captured after the end of July and none was taken among those returning to the Anderson River in late August.

Gonadosomatic index (GSI) for spawning females ($n=31$) ranged from 2.15 to 10.45 with a mean of 5.27. Mean GSI for spawning females increased from 3.96 in June to 6.82 in early August (Table 9). Only three spawning males were identified in 1990. GSI values for these fish, taken between 22-25 July, ranged from 0.97 to 2.01. Within our aged sample, the youngest Arctic cisco judged capable of spawning in the current year were an age 12 female and an age 13 male (Table 7).

Tagging results: Floy tags were applied to 2225 Arctic cisco in 1990, bringing to 3285 the total number applied during the two years of this study. To date (June 1992) only two recaptures have been reported. One fish, tagged 5 September 1989 in Wood Bay, was recaptured during summer 1991 in Tuktoyaktuk Harbour. The second, tagged 11 August 1990, was recaptured 23 July 1991 in Liverpool Bay. In addition, an Arctic cisco tagged at McKinley Bay (Fig. 1) on 30 July 1988 by LGL personnel was recaptured in Wood Bay on 27 July 1990. These returns provide the first evidence that Arctic cisco found in Wood Bay originate in the Mackenzie River.

Least cisco

Size distribution and seasonal abundance: Fork lengths for measured least cisco ($n=4398$) ranged from 51 to 432 mm. Small least cisco (<180 mm) accounted for 72% and 88% of the catch at Stations 503 and 504, respectively, and 84% of the combined species total (Fig. 12). The group of small least cisco included two strong modes; the first, at 80-119 mm, is attributable to age 1 individuals while the second, at 130-159 mm, represents age 2 fish. These cohorts dominated catches during early summer (Fig. 13) and were responsible for the high CPUE values observed during the first three weeks of sampling (Fig. 14). As in 1989 (Bond and Erickson 1991), the number of age 1 and age 2 cisco decreased sharply in the catch after mid-July, resulting in a corresponding decrease in CPUE at Cycle 4 (Fig. 14). Age 0 least cisco (50-79 mm) appeared in early August (Fig. 13); however, unlike 1989 when this age-group dominated late summer catches, age 0 fish were captured only in small numbers in 1990. Higher salinity values at the 1990 sites may have been responsible for these low catches.

Catch rates for large least cisco (≥ 180 mm) averaged 35 fish \cdot d⁻¹ at Station 503 and 37 fish \cdot d⁻¹ at Station 504, and seasonal CPUE

patterns were similar at the two locations (Fig. 15). CPUE for large cisco was high at the beginning of the study, decreased to less than 5 fish · d⁻¹ in Cycles 4 and 5, then increased over the final three weeks to late August peaks of 98 and 66 fish · d⁻¹ at Station 504 and 503, respectively.

A seasonal shift in length-frequency distribution among large least cisco that is not shown clearly in Fig. 13 imparts some confusion to the CPUE graphs (Fig. 15). Over the first three weeks, 62% of large cisco were individuals in the 180-249 mm size range. Their reduced abundance is reflected by the declining CPUE values observed during this time period. In contrast, the relative abundance of least cisco ≥250 mm increased during the late stages of our study so that fish of this size accounted for 74% of large least cisco captured in Cycles 4 to 8 and 79% in the final two weeks.

Age and growth: Otolith age estimates for least cisco ranged from 0 to 19 years (Table 10) but the majority of fish captured (>75%) were either age 1 or age 2. Using length as an indication of age, the spawning segment of the population (≥250 mm) consisted primarily of age-groups 6 through 14. The relationship between fork length and body weight for least cisco captured in Wood Bay in 1990 (Table 8) is described by the equation:

$$\log_{10} W = 3.1637 (\log_{10} L) - 5.4810$$

Sex and maturity: Females accounted for 59% of all least cisco for which sex was determined (n=103). The male:female sex ratio of 0.69, however, was not significantly different from 1:1 ($X^2=3.50$; $P>0.05$). Among fish of potential spawning size (≥250 mm) (n=75), 68% were females and the male:female ratio (0.47) did differ significantly from unity ($X^2=15.08$; $P<0.005$).

Current-year spawners represented a smaller proportion of our sample in 1990 than in 1989 (Bond and Erickson 1991). Overall, 30% of females and 10% of males examined were determined to be capable of spawning in 1990. Among fish ≥250 mm, 35% of females and 17% of males were spawners. The smaller proportion of current-year spawners in the 1990 catch compared with 1989 may have resulted from sampling inconsistencies or from the earlier termination of field studies in 1990 (25 August vs 5 September). Sampling during the last week of August and first week of September yielded many spawning least cisco in 1989.

Gonadosomatic index values for spawning females ranged from 2.90 to 11.80 with a mean of 5.15. Mean GSI increased from 3.43 in June to 7.91 in August (Table 9). The low value in August suggests that the 1990 samples were acquired relatively early in the pre-spawning period. Late August-early September samples in 1989 yielded a mean GSI of 14.95, with values for individual fish ranging up to 19.40. Individual GSI values for male spawners (n=4) varied from 1.12 to 2.53 (Table 9). In 1990, the youngest least cisco judged to be current-year spawners were a 6-year-old male (261 mm) and a 9-year-old female (322 mm).

Broad whitefish

Size distribution and seasonal abundance: Fork lengths of Wood Bay broad whitefish ranged from 50 to 622 mm during 1990 (Fig. 16 and 17). Small individuals (<150 mm) accounted for 33% of the species catch compared with 82% in 1989 (Bond and Erickson 1991). Higher salinity values at the 1990 sampling locations may have been responsible for this decreased incidence of small broad whitefish. Two strong modes occurred within this portion of the length-frequency distribution. Age 1 fish (90-119 mm) were present from the beginning of the sampling period (Fig. 17) and were responsible for the relatively high catch rates observed during Cycle 1 (Fig. 18). Age 0 fish (50 - 69 mm) appeared in Cycle 3 and, together with age 1 individuals, produced a second abundance peak at that time. With increased salinity, CPUE for small broad whitefish dropped sharply in Cycle 4 and remained at low levels until the end of the sampling period (Fig. 18). Large broad whitefish were more abundant overall at Station 503 (17 fish · d⁻¹) than at Station 504 (11 fish · d⁻¹) (Table 6) but the seasonal trend in CPUE was similar at the two locations (Fig. 19).

Age and growth: Age and growth features for broad whitefish taken in Wood Bay during 1990 are summarized in Table 11. Otolith age estimates ranged from 0 to 28 years, the maximum being considerably older than was reported in 1989 (16 years). Among large broad whitefish there was a more uniform distribution of lengths (and therefore ages) than was observed in 1989. For example, the 1989 sample featured a paucity of fish in the 150-299 mm length range which, we postulated, indicated an under-representation of age 2, 3, and 4 whitefish (Bond and Erickson 1991). This gap in the length-frequency distribution did not occur in 1990 (Fig. 16) but was filled

by what are thought to be primarily age 4 and 5 fish. The group of large juveniles (300-429 mm) was well represented in 1990 and is thought to consist of age 6-11 individuals. The spawning portion of the population (>429 mm) appears to consist of fish age 13 and older. Although it may be simply the result of small sample size, an interesting feature of our age structure is the absence of broad whitefish of the 1978 year-class (age 12 in 1990) during both years of the study. The weight-length equation for broad whitefish captured in Wood Bay in 1990 (Table 8) is:

$$\log_{10}W = 3.2487 (\log_{10}L) - 5.5784$$

Sex and maturity: Sex was determined for 136 broad whitefish in 1990, of which 72 (53%) were females. The overall sex ratio was not significantly different from 1:1 ($X^2=0.50$; $P>0.05$). Among fish of spawning size (≥ 425 mm)($n=65$), females accounted for 63% and the male:female ratio (0.89) was significantly different from unity ($X^2=4.45$; $P<0.05$). Within this group of large fish, 56% of the females and 33% of the males were considered current-year spawners.

Female spawners had GSI values ranging from 2.07 to 11.08, the mean increasing from 3.70 in June to 6.84 in August (Table 9). The low August value suggests that our sample was obtained early in the pre-spawning period. In 1989, spawners captured in late August and early September had a mean GSI of 12.57 (Bond and Erickson 1991). The gonadosomatic index for male spawners ($n=8$) ranged from 0.88 to 1.30 (Table 9). The youngest broad whitefish judged capable of spawning during the current season were an age 16 male (541 mm) and an age 13 female (556 mm).

Lake whitefish

Size distribution and seasonal abundance: Measured lake whitefish ($n=3435$) varied in fork length from 69-526 mm, but 45% of the catch consisted of individuals in the 370-459 mm size range. Similar results were observed at both sampling locations (Fig. 20). Fish of this size range made up 54% of large lake whitefish (≥ 150 mm), which accounted for 82% of the total catch. Among small lake whitefish, two modes are apparent in the length-frequency distribution. Age 2 fish (140-149 mm) accounted for most of the small individuals taken during the first week of sampling (Fig. 21). Age 1 fish (90-109 mm) appeared in the trap nets during Cycle

3 producing an abundance peak at that time (Fig. 22). This peak was most pronounced at Station 503 (41 fish \cdot d⁻¹). Decreased catch rates for small lake whitefish after Cycle 3 coincided with increased salinity at the two sampling sites (Fig. 7). Age 0 lake whitefish ($n=1$) were not taken in the trap nets until the final week of sampling.

Large lake whitefish occurred in equal abundance overall (40 fish \cdot d⁻¹) at both trap net locations (Table 6). An increase in the catch rates over the last few weeks of the summer (to 68 fish \cdot d⁻¹ at the Station 503 and 75 fish \cdot d⁻¹ at Station 504) suggests a return migration to the Anderson River at that time (Fig. 23).

Age and growth: Age and growth features for lake whitefish are presented in Table 12. Otolith age estimates in our sample ranged from 2 to 34 years. Growth is rapid up until about age 10 but slower thereafter. The mathematical relationship between fork length and body weight for lake whitefish captured in Wood Bay during 1990 (Table 8) is described by the equation:

$$\log_{10}W = 3.2773 (\log_{10}L) - 5.6966$$

Sex and maturity: Sex was determined for 129 lake whitefish of which 65 (50%) were females. Among fish which, by virtue of their length (i.e., ≥ 375 mm FL), were potential spawners ($n=71$), females accounted for 51%. Within this group of large fish, 61% of the females but only 17% of the males were identified as current-year spawners.

Among females, GSI values for current-year spawners ($n=22$) ranged from 2.89 to 12.77. Mean GSI for spawning females increased from 4.32 ($n=6$) in late June to 11.31 ($n=6$) in August. For male whitefish, no current-year spawners were identified from our June samples ($n=14$), but mean GSI increased from 1.35 ($n=4$) in July to 1.53 ($n=2$) in August (Table 9). The youngest lake whitefish considered to be current-year spawners were 10 (male) and 11 (female) years of age (Table 12).

Inconnu

Size distribution and seasonal abundance: Inconnu captured in 1990 varied in fork length from 60 to 1190 mm, but most were either 125-174 mm (29%) or 400-649 mm (31%)(Fig. 24 and 25). Compared with 1989, the length-frequency distribution was more uniform, with better representation in the 200-399 mm range (18%),

particularly at Station 503 (25%). Age 0 inconnu were first captured on 21 July ($n=3$; 60-66 mm) but this age-group was taken only in small numbers. In contrast, 1989 trap net catches were dominated by age 0 inconnu, especially at Station 501 where salinity was low (usually $<5 \text{ g} \cdot \text{kg}^{-1}$) (Bond and Erickson 1991). Coastal dispersal of young inconnu appears to be severely restricted by salinity.

CPUE for inconnu averaged $6.9 \text{ fish} \cdot \text{d}^{-1}$ at Station 503 and $7.0 \text{ fish} \cdot \text{d}^{-1}$ at Station 504 (Table 6). The seasonal trends in CPUE were also similar at the two locations (Fig. 26). The trend lines shown in Fig. 26 were strongly influenced by age 1 inconnu (125-174 mm) which dominated the catch between 8 July and 11 August (Fig. 25). The sharp decrease in CPUE in Cycle 6 coincides with an abrupt increase in salinity which occurred at that time (Fig. 7), and with the disappearance of age 1 fish from the catch.

Age and growth: Age and growth features for inconnu captured in Wood Bay during 1990 are summarized in Table 13. Anderson River inconnu apparently live a very long time. To our knowledge the maximum otolith age in our sample (39 years) represents the oldest age ever reported for this species. Using size as an indicator of age, most inconnu in our sample were younger than 12 years with age 1 being the most abundant age-group (1989 year-class). The mathematical relationship between body weight and fork length for inconnu captured in Wood Bay during 1990 (Table 8) is described by the equation:

$$\log_{10} W = 3.1130 (\log_{10} L) - 5.3805$$

Sex and maturity: Sex was determined for 187 inconnu, of which 110 (59%) were males. The male:female ratio of 1.43 differed significantly from unity ($X^2=5.82$; $P<0.05$). No current-year spawners were identified among the male inconnu examined, but two females were judged capable of spawning in 1990.

We calculated the gonadosomatic index for 75 inconnu $\geq 500 \text{ mm}$ fork length (Table 9). GSI values for 29 non-spawning males ranged from 0.03 to 0.35 while values for 44 non-spawning females varied from 0.10 to 2.60. The two females classified as current-year spawners were very large, old fish. One, captured 22 July (GSI = 5.90) had a fork length of 1134 mm and was aged at 30 years. The second, captured 2 August (GSI = 6.65) was 1085 mm long with an otolith age of 38 years.

The age of first spawning could not be determined from the inconnu in our sample.

Mackenzie River inconnu begin to spawn at a scale age of 6 years (Stein et al. 1973; Percy 1975).

Arctic flounder

Arctic flounder made up 42% of the total catch in Wood Bay during 1990 and accounted for 85% of all marine fish taken in the traps (Tables 3 and 5). CPUE was higher overall at Station 504 ($449 \text{ fish} \cdot \text{d}^{-1}$) than at Station 503 ($307 \text{ fish} \cdot \text{d}^{-1}$) (Table 6), although large daily and weekly fluctuations occurred at both sites, particularly during early summer. The total daily catch of this species exceeded 1000 on 15 occasions during the summer with a peak of 5295 on 18 July (Cycle 3). Flounder were already present in large numbers in the study area by the time sampling began (Fig. 27). Catches peaked in Cycle 3 (15-21 July) at $1204 \text{ fish} \cdot \text{d}^{-1}$ at Station 503 and $930 \text{ fish} \cdot \text{d}^{-1}$ at Station 504. A second peak ($860 \text{ fish} \cdot \text{d}^{-1}$) was observed at Station 504 during Cycle 5 as flounder were apparently leaving the study area. The pattern observed in 1990 is similar to that described in Wood Bay in 1989 (Bond and Erickson 1991) and elsewhere on the eastern Beaufort Sea coast (Bond and Erickson 1989). Arctic flounder spawn and overwinter in offshore marine areas. Shortly after breakup they invade inshore areas, particularly in the vicinity of river mouths, presumably to feed, returning to offshore waters by early August.

Rainbow smelt

Anadromous rainbow smelt accounted for 12% of the total trap net catch at Wood Bay during 1990 (Tables 3 and 5). Smelt were much more abundant at Station 503 where they made up 24% of the total catch resulting in an average CPUE of $197 \text{ fish} \cdot \text{d}^{-1}$. The largest daily catches at Station 503 occurred between 22 and 25 July, resulting in a weekly CPUE value of $762 \text{ fish} \cdot \text{d}^{-1}$ during Cycle 4. By comparison, the overall CPUE at Station 504 was just $15 \text{ fish} \cdot \text{d}^{-1}$ (Table 6) and CPUE remained consistently low throughout the summer (Fig. 28).

Fourhorn sculpin

Fourhorn sculpin made up 3% of total catch in Wood Bay during 1990, and was the second most abundant marine species taken (Table 3 and 5). Although overall CPUE was virtually identical at the two locations (28 vs 27 $\text{fish} \cdot \text{d}^{-1}$) (Table 6), the seasonal trends differed between Stations (Fig. 29). From a mean value of $9 \text{ fish} \cdot \text{d}^{-1}$ during Cycle 1, CPUE at Station 504 rose sharply to a peak of $82 \text{ fish} \cdot \text{d}^{-1}$ during Cycle 3, dropped to $4 \text{ fish} \cdot \text{d}^{-1}$ in Cycle 6 then rose

again to 25 fish \cdot d⁻¹ during the final week of the study. After averaging 40 fish \cdot d⁻¹ during Cycle 1, CPUE at Station 503 fluctuated between 15 and 30 fish \cdot d⁻¹ throughout the next six weeks before rising to 53 fish \cdot d⁻¹ in Cycle 8.

Pacific herring

Pacific herring contributed only a small proportion (0.5%) of the trap net catch at Wood Bay during 1990 (Tables 3 and 5). Weekly CPUE values peaked during Cycle 1 at Station 503 (15 fish \cdot d⁻¹) and during Cycle 3 at Station 504 (24 fish \cdot d⁻¹), but declined quickly from their early highs and remained at low levels through the second half of the sampling period (Fig. 30). Over the course of the study, catch rates averaged 4 fish \cdot d⁻¹ at Station 503 and 5 fish \cdot d⁻¹ at Station 504 (Table 6).

Saffron cod

Saffron cod accounted for just 0.9% of the total catch and 1.8% of all marine fish taken in trap nets at Wood Bay in 1990 (Tables 3 and 5). Seasonal trends in CPUE were similar at the two sampling locations until the final week of the study when the catch rate rose sharply to 28 fish \cdot d⁻¹ at Station 503 (Fig. 31). For the study, CPUE averaged 10 fish \cdot d⁻¹ at Station 503 and 6 fish \cdot d⁻¹ at Station 504 (Table 6).

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Table 1. Inclusive dates for sampling cycles referred to in this report and amount of fishing effort (days) at each trap by cycle, Wood Bay, 1990¹.

Cycle	Date	Fishing Effort (d)			
		Station 503		Station 504	
		Side 1	Side 2	Side 1	Side 2
1	01 July to 07 July	5.82	5.85	6.85	6.82
2	08 July to 14 July	7.07	5.01	7.07	7.04
3	15 July to 21 July	6.93	6.93	6.89	6.97
4	22 July to 28 July	6.98	4.98	6.02	7.09
5	29 July to 04 August	7.09	6.03	7.04	7.00
6	05 August to 11 August	6.92	6.98	6.94	6.95
7	12 August to 18 August	7.15	7.15	7.16	7.15
8	19 August to 25 August	7.00	5.99	6.89	6.92
Total	(days)	54.97	48.92	54.84	55.93
	(hours)	1319.3	1174.1	1316.2	1342.4

¹Side 1 refers to the Anderson River side of the lead.

Table 2. Scientific and common names¹ of fishes captured at Wood Bay, 1990.

Scientific Name	Common Name	Code
Family Petromyzontidae		
<u>Lampetra japonica</u> (Martens)	Arctic lamprey	LAMP
Family Clupeidae		
<u>Clupea pallasii</u> Valenciennes	Pacific herring	PCHR
Family Salmonidae		
<u>Coregonus autumnalis</u> (Pallas)	Arctic cisco	ARCS
<u>Coregonus sardinella</u> Valenciennes	Least cisco	LSCS
<u>Coregonus clupeaformis</u> (Mitchill)	Lake whitefish	LKWT
<u>Coregonus nasus</u> (Pallas)	Broad whitefish	BDWT
<u>Prosopium cylindraceum</u> (Pallas)	Round whitefish	RDWT
<u>Stenodus leucichthys</u> (Guldenstadt)	Inconnu	INCO
<u>Salvelinus alpinus</u> (Linnaeus)	Arctic char	CHAR
<u>Thymallus arcticus</u> (Pallas)	Arctic grayling	ARGR
Family Osmeridae		
<u>Osmerus mordax</u> (Mitchill)	Rainbow smelt	RNSM
<u>Mallotus villosus</u> (Müller)	Capelin	CPLN
Family Esocidae		
<u>Esox lucius</u> Linnaeus	Northern pike	NRPK
Family Catostomidae		
<u>Catostomus catostomus</u> (Forster)	Longnose sucker	LNSK
Family Gadidae		
<u>Lota lota</u> (Linnaeus)	Burbot	BRBT
<u>Eleginus gracilis</u> (Tilesius)	Saffron cod	SFCD
<u>Boreogadus saida</u> (Lepechin)	Arctic cod	ARCD
Family Gasterosteidae		
<u>Pungitius pungitius</u> (Linnaeus)	Ninespine stickleback	NSSB
Family Stichaeidae		
<u>Acantholumpenus mackayi</u> (Gilbert)	Blackline prickleback ²	BLPB
Family Cottidae		
<u>Myoxocephalus quadricornis</u> (Linnaeus)	Fourhorn sculpin	FHSC
Family Pleuronectidae		
<u>Pleuronectes glacialis</u> Pallas	Arctic flounder	ARFL
<u>Platichthys stellatus</u> (Pallas)	Starry flounder	STFL

¹ From Robins et al. (1991) except as noted.

² Common name recommended by Legendre et al. (1975).

Table 3. Total catch and species composition in trap nets, Wood Bay, 1990.

Species	Number Captured	Percent of Total Catch	Percent of Anadromous Catch
Anadromous			
Least cisco	23 490	24.1	46.9
Broad whitefish	2 249	2.3	4.5
Arctic cisco	6 690	6.9	13.4
Lake whitefish	5 171	5.3	10.3
Rainbow smelt	11 255	11.5	22.5
Inconnu	743	0.8	1.5
Arctic char	2	<0.1	<0.1
Coregonid Hybrids	519	0.5	1.0
Marine			
Arctic flounder	40 570	41.6	
Pacific herring	447	0.5	
Fourhorn sculpin	2 945	3.0	
Saffron cod	841	0.9	
Blackline prickleback	1 753	1.8	
Starry flounder	702	0.7	
Arctic cod	7	<0.1	
Capelin	15	<0.1	
Freshwater			
Longnose sucker	38	<0.1	
Northern pike	60	0.1	
Burbot	1	<0.1	
Ninespine stickleback	13	<0.1	
Arctic grayling	8	<0.1	
Arctic lamprey	12	<0.1	
Round whitefish	3	<0.1	
Total	97 534		

Table 4. Weekly contribution by coregonids to total trapnet catch at each sampling station.

Cycle	Station 503		Station 504	
	Total Catch	Percent Coregonids	Total Catch	Percent Coregonids
1	8 104	39.7	13 806	61.8
2	5 644	28.9	8 335	45.7
3	9 885	28.5	15 731	41.7
4	5 880	7.8	2 445	57.3
5	2 710	26.9	7 099	11.2
6	4 288	26.6	1 957	65.1
7	3 150	45.6	1 391	66.6
8	4 013	42.9	3 096	77.9
Total	43 674	30.1	53 860	47.7

Table 5. Distribution of 1990 trap net catch by station and codend¹.

Species	Station 503			Station 504			Grand Total
	Side 1	Side 2	Total	Side 1	Side 2	Total	
Large least cisco	868	943	1 811	988	1 032	2 020	3 831
Small least cisco	3 701	1 033	4 734	12 558	2 367	14 925	19 659
Broad whitefish	778	492	1 270	594	385	979	2 249
Large Arctic cisco	857	862	1 719	1 643	1 030	2 673	4 392
Small Arctic cisco	285	111	396	1 552	350	1 902	2 298
Lake whitefish	1 344	1 247	2 591	1 053	1 527	2 580	5 171
Rainbow smelt	7 493	2 944	10 437	645	173	818	11 255
Inconnu	164	190	354	125	264	389	743
Arctic char	1		1	1		1	2
Coregonid hybrids	120	156	276	48	195	243	519
Arctic flounder	6 482	9 226	15 708	11 877	12 985	24 862	40 570
Pacific herring	105	84	189	155	103	258	447
Fourhorn sculpin	898	568	1 466	1 010	469	1 479	2 945
Saffron cod	413	128	541	255	45	300	841
Blackline prickleback	1 153	596	1 749	2	2	4	1 753
Starry flounder	176	164	340	168	194	362	702
Arctic cod	3	4	7				7
Capelin	6	4	10	4	1	5	15
Longnose sucker	10	4	14	15	9	24	38
Northern pike	18	18	36	16	8	24	60
Burbot		1	1				1
Ninespine stickleback	3	8	11	2		2	13
Arctic grayling	3		3	5		5	8
Arctic lamprey	2	7	9	3		3	12
Round whitefish	1		1	2		2	3
Total	24 884	18 790	43 674	32 721	21 139	53 860	97 534

¹ Side 1 refers to the Anderson River side of the lead.

Table 6. Overall CPUE (number·d⁻¹) for the major fish species by station and codend¹.

Species	Station 503			Station 504		
	Side 1	Side 2	Combined	Side 1	Side 2	Combined
Large least cisco	15.8	19.3	35.1	18.0	18.5	36.5
Small least cisco	67.3	21.1	88.4	229.0	42.3	271.3
Large broad whitefish	8.4	9.0	17.4	5.4	5.6	11.0
Small broad whitefish	5.8	1.0	6.8	5.5	1.3	6.7
Large Arctic cisco	15.6	17.6	33.2	30.0	18.4	48.4
Small Arctic cisco	5.2	2.3	7.5	28.3	6.3	34.6
Large lake whitefish	15.7	23.8	39.5	14.1	25.6	39.7
Small lake whitefish	8.7	1.7	10.4	5.1	1.7	6.8
Inconnu	3.0	3.9	6.9	2.3	4.7	7.0
Arctic flounder	117.9	188.6	306.5	216.6	232.2	448.7
Rainbow smelt	136.3	60.2	196.5	11.8	3.1	14.9
Fourhorn sculpin	16.3	11.6	27.9	18.4	8.4	26.8
Pacific herring	1.9	1.7	3.6	2.8	1.8	4.7
Saffron cod	7.5	2.6	10.1	4.6	0.8	5.5
Longnose sucker	0.2	0.1	0.3	0.3	0.2	0.4
Starry flounder	3.2	3.4	6.6	3.0	3.5	6.5

¹ Side 1 refers to the Anderson River side of the lead.

Table 7. Mean fork length (mm), mean weight (g), mean condition factor (K), sex ratio, and maturity by age-group for Arctic cisco at Wood Bay, 1990.

Otolith Age (yr)	Number of Fish	Fork Length			Weight			Mean Condition Factor (K)	Males		Females		Number Sex Unknown
		Mean	SD	Range	Mean	SD	Range		n	% Spawners	n	% Spawners	
0	53 ¹	68	7.7	53- 84								53	
1	50 ²	102	6.4	86-117								50	
2	14	168	15.1	150-203	40	15.8	25- 85	0.82	1	0	4	0	9
3	15	201	14.5	172-227	74	18.6	48- 111	0.90	1	0	6	0	8
4	12	244	16.8	216-272	141	27.9	100- 195	0.96	1	0	9	0	2
5	6	274	8.7	262-284	196	33.4	150- 233	0.95	3	0	3	0	
6	7	294	5.8	285-300	244	29.3	202- 278	0.96	4	0	2	0	1
7	10	307	8.2	292-321	269	33.2	225- 333	0.93	5	0	5	0	
8	6	338	18.4	319-372	359	65.6	275- 478	0.92	5	0	1	0	
9	3	346	4.0	342-350	380	81.9	290- 450	0.92	2	0	1	0	
10	7	360	12.6	344-380	484	63.5	400- 575	1.03	3	0	4	0	
11	5	358	10.4	347-374	443	43.2	400- 500	0.97	2	0	3	0	
12	10	383	18.0	346-410	651	135.8	450- 872	1.14	3	0	7	14	
13	6	401	9.5	385-411	694	48.3	600- 731	1.08	1	100	5	40	
14	2	414	1.4	413-415	842	120.9	756- 927	1.19			2	0	
15	3	421	4.0	417-425	756	65.6	700- 828	1.02	1	100	2	0	
16	5	428	3.0	424-432	876	140.7	724-1107	1.11			5	0	
17	2	437	0.7	436-437	1022	147.8	917-1126	1.23			2	0	
18	1	440			900			1.06			1	100	
19	2	446	0.7	445-446	906	203.6	762-1050	1.03			2	50	
24	1	474			962			0.90			1	100	
Total	220								32		65		123

¹ Captured 3-21 August; aged by length-frequency² Captured 1-2 July; aged by length-frequency

Table 8. Weight-length regressions for coregonids captured in Wood Bay, 1990.

Species	n	Length Range (mm)	Slope (b)	Intercept (a)	Std. Error of Est.		R ²
					(b)	(a)	
Arctic cisco	273	150- 474	3.2485	-5.6336	0.0318	0.0805	0.9747
Least cisco	122	158- 432	3.1637	-5.4810	0.0520	0.1266	0.9686
Broad whitefish	149	151- 622	3.2487	-5.5784	0.0385	0.0992	0.9798
Lake whitefish	160	154- 571	3.2773	-5.6966	0.0290	0.0730	0.9878
Inconnu	215	151-1190	3.1130	-5.3805	0.0144	0.0396	0.9954

Table 9. Comparison of Gonadosomatic Index data between early, mid- and late summer by species, sex, and maturity category, Wood Bay, 1990.¹

Species/Category	17-30 June			July			August		
	No. Examined	GSI		No. Examined	GSI		No. Examined	GSI	
		Mean	Range		Mean	Range		Mean	Range
Arctic Cisco (≥ 330mm)									
Females									
Spawners	12	3.96	2.15-7.22	16	5.96	2.29-10.45	3	6.82	6.25- 7.71
Non-Spawners	23(17)	0.80	0.20-1.48	34(32)	0.97	0.33- 1.96	50(48)	1.49	0.21- 5.39
Males									
Spawners	0	-	-	3	1.56	0.97- 2.01	0	-	-
Non-Spawners	25(3)	0.21	0.17-0.27	18(16)	0.26	0.06- 0.76	16(5)	0.45	0.16- 0.89
Least Cisco (≥ 250mm)									
Females									
Spawners	1	3.43	-	11	3.80	2.90- 4.42	6	7.91	5.27-11.80
Non-Spawners	11(2)	1.00	0.80-1.20	14(10)	1.04	0.43- 1.78	8(3)	0.78	0.68- 0.93
Males									
Spawners	0	-	-	2	2.00	1.46- 2.53	2	1.18	1.12- 1.23
Non-Spawners	7(0)	-	-	7(0)	-	-	6(3)	0.71	0.46- 0.88
Broad Whitefish (≥ 425mm)									
Females									
Spawners	7	3.70	2.07-4.47	9	5.35	3.67- 8.24	7	6.84	4.57-11.08
Non-Spawners	9(8)	1.20	0.81-1.63	4	1.37	0.47- 2.00	5	0.43	0.36- 0.54
Males									
Spawners	1	1.15	-	2	1.08	0.98- 1.18	5	1.09	0.88- 1.30
Non-Spawners	4(0)	-	-	7(6)	0.37	0.08- 0.60	5(1)	0.46	-
Lake Whitefish (≥ 375mm)									
Females									
Spawners	6	4.32	2.89-9.45	9	5.36	3.00- 8.27	6	11.31	9.79-12.77
Non-Spawners	2(1)	1.33	-	7(5)	1.43	0.89- 1.98	6(5)	1.02	0.57- 1.38
Males									
Spawners	0	-	-	4	1.35	1.25- 1.54	2	1.53	1.40- 1.66
Non-Spawners	14(1)	0.13	-	9(2)	0.64	0.60- 0.68	6(3)	0.33	0.14- 0.47
Inconnu (≥ 500mm)									
Females									
Spawners	0	-	-	1	5.90	-	1	6.65	-
Non-Spawners	20(11)	0.52	0.10-2.60	14	0.81	0.23- 1.92	20(19)	0.69	0.13- 2.22
Males									
Spawners	0	-	-	0	-	-	0	-	-
Non-Spawners	46(8)	0.21	0.12-0.25	10(8)	0.20	0.03- 0.35	17(13)	0.21	0.09- 0.32

¹ Numbers in parentheses indicate sample size for GSI calculations where all examined fish not used. Where not used, gonad weight was < 1g. All

Table 10. Mean fork length (mm), mean weight (g), mean condition factor (K), sex ratio, and maturity by age-group for least cisco at Wood Bay, 1990.

Otolith Age (yr)	Number of Fish	Fork Length			Weight			Mean Condition Factor (K)	Males		Females		Number Sex Unknown
		Mean	SD	Range	Mean	SD	Range		n	% Spawners	n	% Spawners	
0	35 ¹	66	5.6	51-80									35
1	33 ²	93	6.9	72-103									33
2	14 ²	138	9.7	123-155									14
3	11	187	14.7	169-225	55	17.0	25-95	0.83	5	0	2	0	4
4	14	210	13.2	192-228	76	23.0	50-109	0.80	8	0	3	0	3
5	6	238	10.2	226-253	119	22.2	100-158	0.87	3	0	2	0	1
6	10	259	13.4	241-289	131	31.8	100-200	0.76	5	20	5	0	
7	7	275	9.5	262-291	173	34.0	148-235	0.82	2	0	5	0	
8	2	286	9.2	279-292	190	15.6	179-201	0.82	2	50			
9	4	303	13.9	290-322	235	60.5	175-319	0.84	3	0	1	100	
10	4	309	11.4	294-319	242	40.1	200-294	0.82	1	0	3	0	
11	7	329	13.3	312-347	316	82.6	225-449	0.87	2	50	5	40	
12	6	337	17.3	310-361	341	72.3	275-444	0.88			6	67	
13	4	352	16.4	337-375	387	92.0	311-512	0.88	1	0	3	67	
14	4	349	31.8	304-378	416	153.2	225-589	0.94	1	0	3	67	
15	2	355	2.8	353-357	366	21.9	350-381	0.82			2	0	
16	5	369	25.7	324-387	445	92.2	300-552	0.88			5	40	
17	2	372	4.9	368-375	433	31.8	410-455	0.84			2	100	
18	3	376	14.6	361-390	445	126.5	325-577	0.82			2	0	
19	1	401			589			0.91			1	100	
Total	174								33		50		91

¹ Captured 30 July - 17 August; aged by length-frequency² Captured 1 July; aged by length-frequency

Table 11. Mean fork length (mm), mean weight (g), mean condition factor (K), sex ratio, and maturity by age-group for broad whitefish at Wood Bay, 1990.

Otolith Age (yr)	Number of Fish	Fork Length			Weight			Mean Condition Factor (K)	Males		Females		Number Sex Unknown
		Mean	SD	Range	Mean	SD	Range		n	% Spawners	n	% Spawners	
0	50 ¹	62	3.3	50-70									50
1	45 ²	97	8.7	83-118									45
2	9	169	17.9	151-203	53	22.9	25-101	1.05	1	0	2	0	6
3	5	206	23.7	172-227	87	39.1	25-122	0.93	2	0	1	0	2
4	7	258	6.8	251-271	182	33.1	125-235	1.05	2	0	4	0	1
5	4	267	8.0	257-275	215	32.9	195-264	1.12	1	0	1	0	2
6	8	303	11.3	289-316	309	34.3	250-350	1.11	5	0	3	0	
7	17	328	17.3	290-354	379	67.5	235-525	1.07	8	0	7	0	2
8	11	363	27.6	331-421	528	137.4	325-797	1.09	6	0	5	0	
9	19	404	28.2	360-451	815	199.2	518-1208	1.21	13	0	6	0	
10	11	412	22.7	379-438	845	191.0	550-1115	1.19	6	0	5	0	
11	4	437	74.0	360-511	1160	655.6	550-2000	1.28	1	0	3	0	
12													
13	4	540	40.5	480-569	1914	827.2	1000-3005	1.18	1	0	3	33	
14	2	469	15.6	458-480	1192	11.3	1184-1200	1.16	1	0	1	100	
15	6	489	20.0	455-517	1475	385.3	1050-1986	1.26	1	0	5	40	
16	11	495	33.8	450-548	1692	595.8	1000-2832	1.36	1	100	10	90	
17	12	510	38.0	416-556	1717	491.5	660-2536	1.25	7	57	5	40	
18	9	534	52.6	440-622	1912	597.1	1025-2954	1.23	3	67	5	60	
19	3	517	11.5	505-528	1612	176.5	1450-1800	1.17	2	50	1	100	
26	2	524	9.9	517-531	2093	166.9	1975-2211	1.45			2	100	
27	1	585			2742			1.37			1	100	
28	1	573			1825			0.97	1	0			
Total	241								62		70		109

¹ Captured 15-19 July; aged by length-frequency² Captured 1-2 July; aged by length-frequency

Table 12. Mean fork length (mm), mean weight (g), mean condition factor (K), sex ratio, and maturity by age-group for lake whitefish at Wood Bay, 1990.

Otolith Age (yr)	Number of Fish	Fork Length			Weight			Mean Condition Factor (K)	Males		Females		Number Sex Unknown
		Mean	SD	Range	Mean	SD	Range		n	% Spawners	n	% Spawners	
1													
2	4	156	2.6	154-160	28	3.2	25- 31	0.73					4
3	19	185	13.4	160-202	55	8.6	50- 75	0.88	1	0	5	0	13
4	15	228	16.5	210-263	111	32.4	75- 181	0.91	3	0	6	0	6
5	8	259	18.7	234-285	168	41.5	100- 229	0.95	3	0	2	0	3
6	10	288	16.3	269-312	250	49.9	196- 329	1.03	5	0	5	0	
7	14	310	15.3	281-332	288	43.4	223- 382	0.96	7	0	5	0	2
8	6	337	19.4	316-363	380	76.5	322- 504	0.99	4	0	1	0	1
9	4	368	5.3	365-376	494	22.9	471- 520	0.99	2	0	2	0	
10	8	370	5.8	361-379	535	47.8	475- 628	1.05	5	20	3	0	
11	3	381	2.0	379-383	597	63.2	525- 642	1.08	2	50	1	0	
12	2	403	6.4	398-407	620	43.1	589- 650	0.95	1	0	1	100	
13	4	399	14.3	386-416	682	86.9	600- 781	1.08	3	33	1	100	
14	4	399	17.7	377-420	664	90.6	581- 775	1.04	2	0	2	0	
15	3	402	10.7	390-409	759	43.5	715- 802	1.17	1	0	2	50	
16	1	430			796			1.00			1	0	
17	1	450			1160			1.27			1	0	
18	3	425	14.7	412-441	883	78.0	785- 923	1.08	1	100	2	100	
19	3	434	14.9	423-451	860	131.9	738-1000	1.05	2	50	1	100	
20	5	466	60.6	421-571	1237	627.7	900-2350	1.15	2	0	3	33	
21	4	453	17.0	437-476	1024	355.8	750-1543	1.08	2	0	2	50	
22	1	509			1830			1.39			1	100	
23	5	473	31.6	440-507	1224	436.5	848-1817	1.12	2	0	2	100	1
24	4	461	25.3	425-483	1205	301.8	900-1621	1.21			3	100	1
25	2	483	14.1	473-493	1199	528.9	825-1573	1.05			2	100	
26													
27	1	455			827			0.88	1	0			
28	2	496	6.4	491-500	1558	65.8	1511-1604	1.28			2	100	
29													
30	1	446			1134			1.28	1	100			
31													
32													
33													
34	2	492	48.8	457-526	1342	412.2	1050-1633	1.11	2	0			
Total	139								52		56		31

Table 13. Mean fork length (mm), mean weight (g), mean condition factor (K), sex ratio, and maturity by age-group for inconnu at Wood Bay, 1990.

Otolith Age (yr)	Number of Fish	Fork Length			Weight			Mean Condition Factor (K)	Males		Females		Number Sex Unknown
		Mean	SD	Range	Mean	SD	Range		n	% Spawners	n	% Spawners	
1	1	151			23			0.67					1
2	12	247	19.9	225- 294	111	34.2	50- 187	0.72	1	0			11
3	21	313	31.5	271- 367	255	87.6	150- 415	0.80	4	0	7	0	10
4	12	387	14.7	355- 402	491	60.5	400- 579	0.84	6	0	6	0	
5	2	407	0.7	406- 407	601	36.1	575- 626	0.90	2	0			
6	11	454	21.2	423- 499	805	121.9	650- 1050	0.86	9	0	2	0	
7	8	491	13.3	470- 510	1025	82.3	925- 1196	0.87	5	0	3	0	
8	11	543	25.6	500- 592	1382	215.6	1150- 1700	0.86	9	0	2	0	
9	6	579	12.3	562- 596	1667	147.2	1550- 1950	0.86	3	0	3	0	
10	9	630	15.1	603- 652	2169	179.4	1925- 2500	0.87	6	0	3	0	
11	10	667	23.8	640- 715	2595	342.8	2050- 3144	0.87	7	0	3	0	
12	2	716	28.3	696- 736	3450	282.1	3250- 3649	0.98	2	0			
13	5	744	10.3	727- 754	3927	303.8	3527- 4266	0.95	4	0	1	0	
14	4	737	26.0	703- 762	3844	287.1	3571- 4200	0.96	3	0	1	0	
15	3	780	6.1	773- 785	4375	108.7	4250- 4450	0.92	1	0	2	0	
16	2	820	41.7	790- 849	4952	845.7	4354- 5550	0.90	1	0	1	0	
17	2	820	20.5	805- 834	4428	455.4	4106- 4750	0.81	2	0			
18	6	835	39.5	796- 904	5406	1052.3	4254- 7100	0.92	2	0	4	0	
19	3	883	13.3	868- 892	6233	461.9	5700- 6500	0.90	1	0	2	0	
20	2	912	24.0	895- 929	6613	265.2	6525- 6800	0.88			2	0	
21	2	946	39.6	918- 974	7338	477.3	7000- 7675	0.87			2	0	
22	2	941		913- 968	7413		6975- 7850	0.90	1	0	1	0	
23													
24	1	1007			8850			0.87			1	0	
25	3	875	4.0	873- 880	6433	600.7	5850- 7050	0.96	2	0	1	0	
26	1	882			5000			0.73	1	0			
27													
28	8	1022	66.0	946-1115	9481	2368.6	6650-12300	0.88	4	0	4	0	
29	1	962			7575			0.85	1	0			
30	4	1051	62.9	984-1134	10550	1954.9	8350-12950	0.91	1	0	3	33	
31	2	1070	10.6	1062-1077	9938	88.4	9875-10000	0.81			2	0	
32	1	1106			12900			0.95			1	0	
33	1	1079			10675			0.85			1	0	
34	5	1040	83.5	963-1165	10225	3705.1	7950-16800	0.89	3	0	2	0	
35	2	1003	39.6	975-1031	9125	1520.3	8050-10200	0.90	2	0			
36	1	1000			7775			0.78	1	0			
37													
38	1	1085			11200			0.88			1	100	
39	1	1190			12975			0.77			1	0	
Total	168								84		62		22

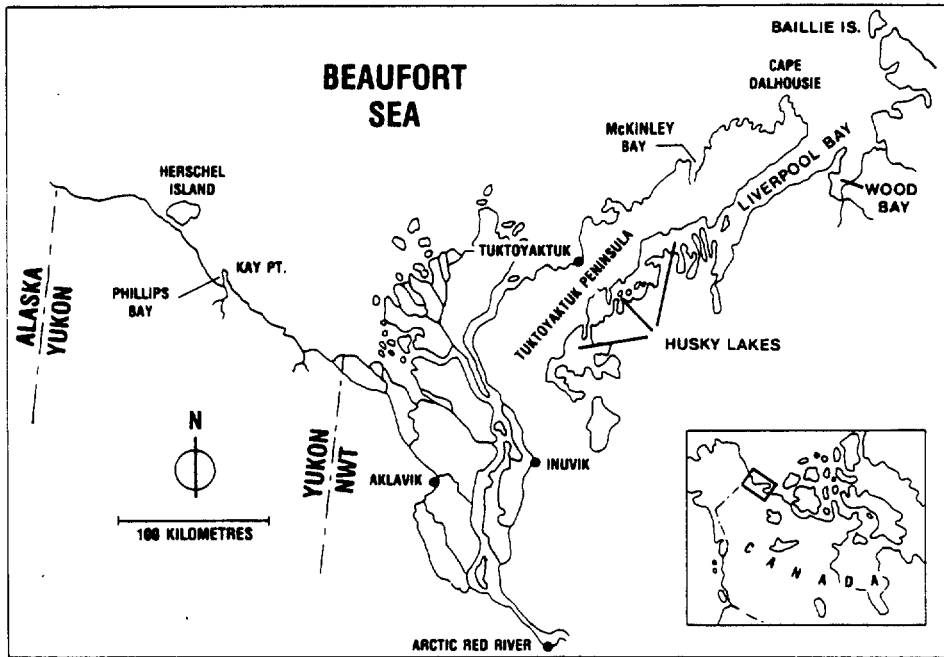


Fig. 1. The Mackenzie Delta and southern Beaufort Sea showing the location of the study area.

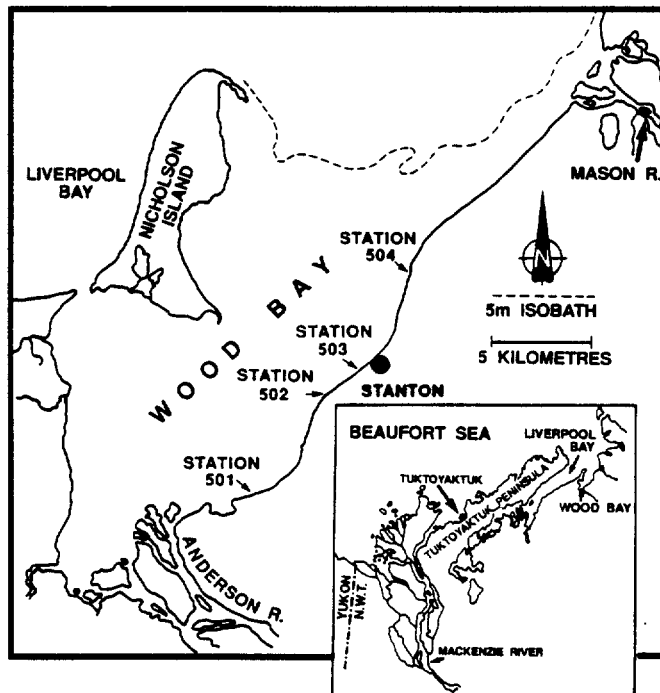


Fig. 2. Wood Bay showing location of the 1990 trap net stations (503 and 504) relative to the 1989 sites (501 and 502).

DAILY DISCHARGE ($\text{m}^3 \cdot \text{s}^{-1}$)

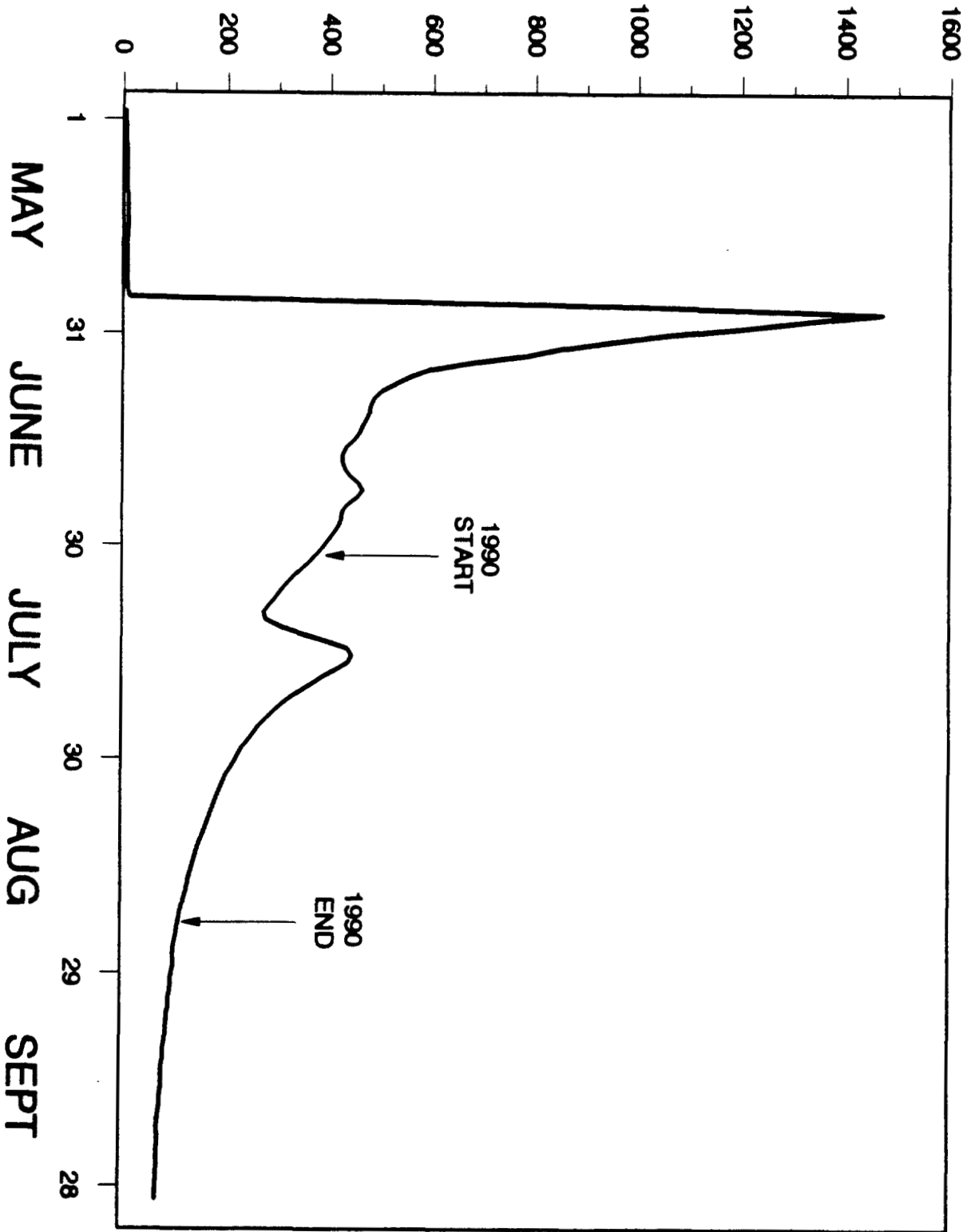


Fig. 3. Daily discharge of the Anderson River from 1 May to 30 September 1990. (Data from Environment Canada 1991). Arrows indicate beginning and end of trap netting operations.

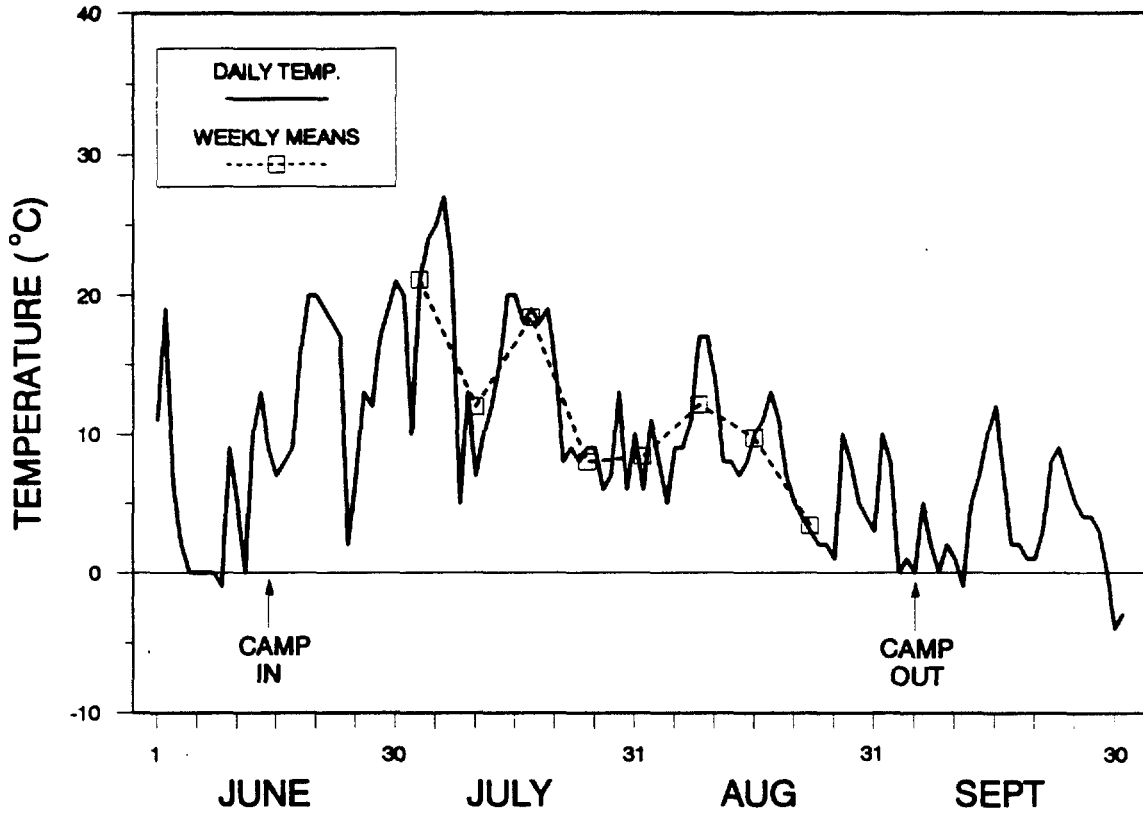


Fig. 4. Maximum daily air temperatures recorded at Nicholson Point, 1 June - 30 September 1990 by Atmospheric Environment Services, Environment Canada.

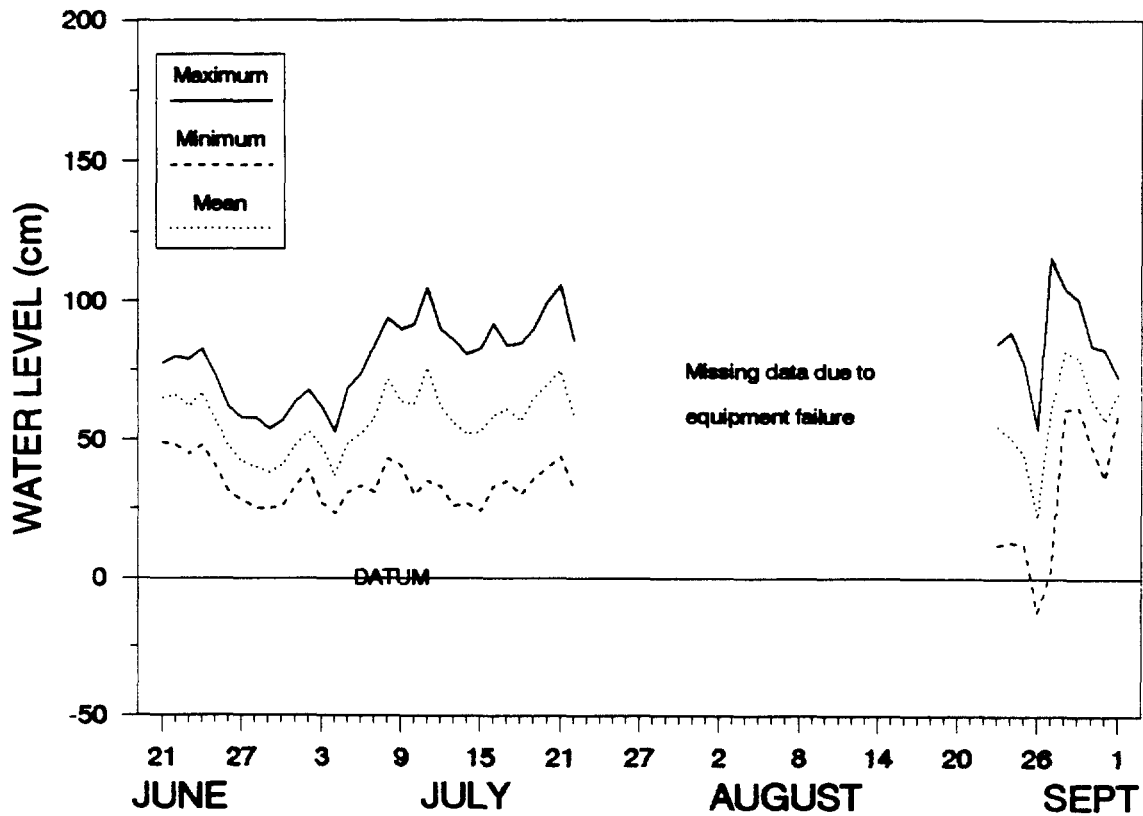


Fig. 5. Water levels recorded at Wood Bay during 1990.

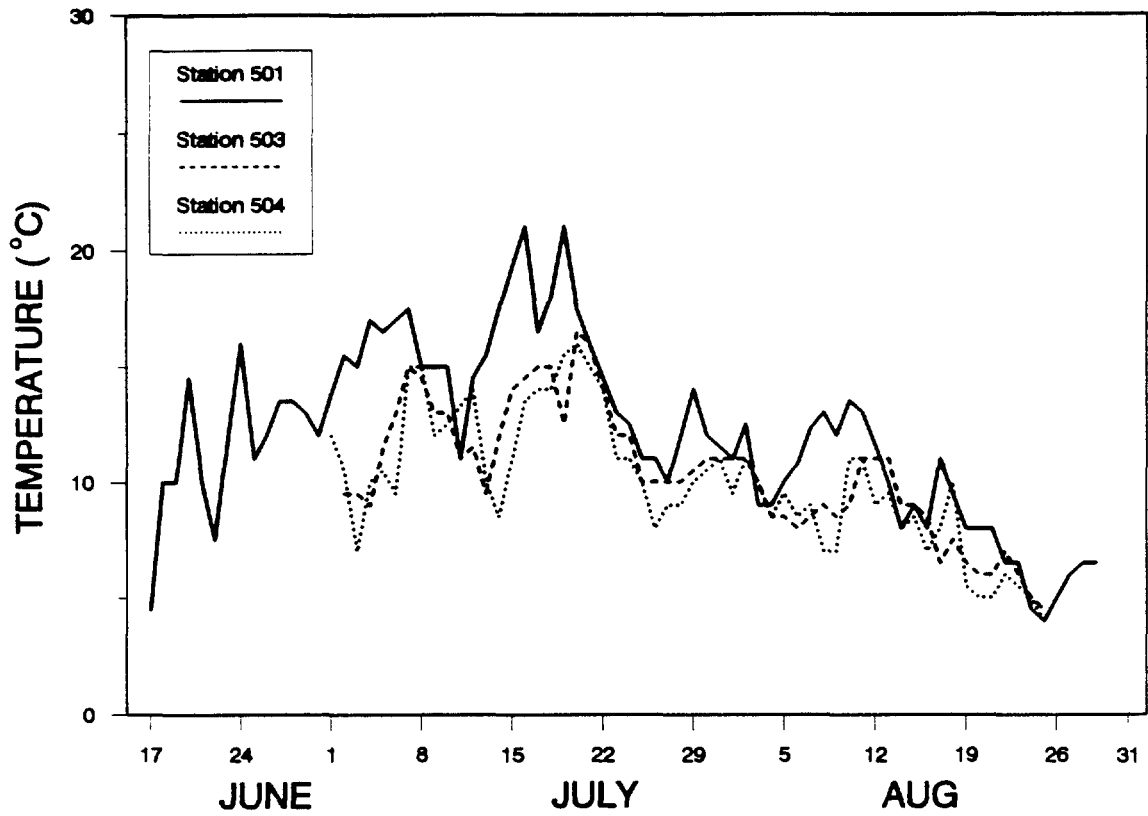


Fig. 6. Daily water temperatures recorded at Wood Bay, 1990.

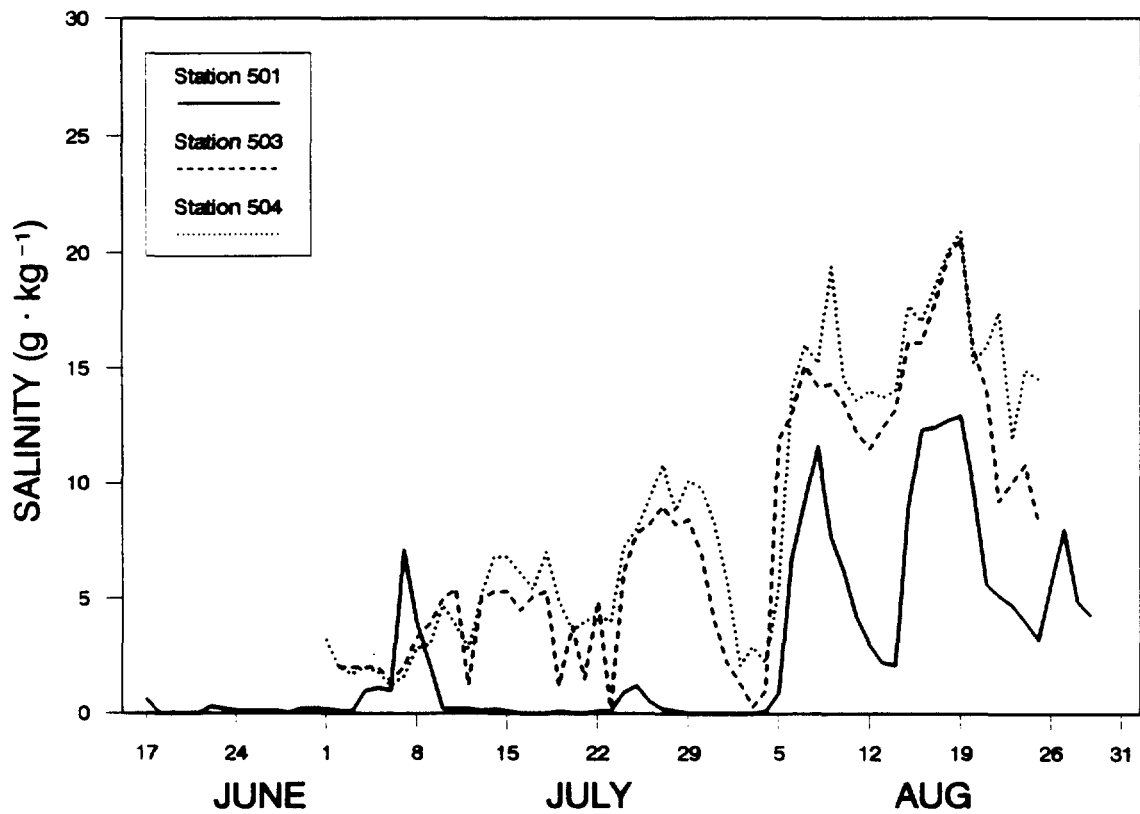


Fig. 7. Daily salinity values recorded at Wood Bay, 1990.

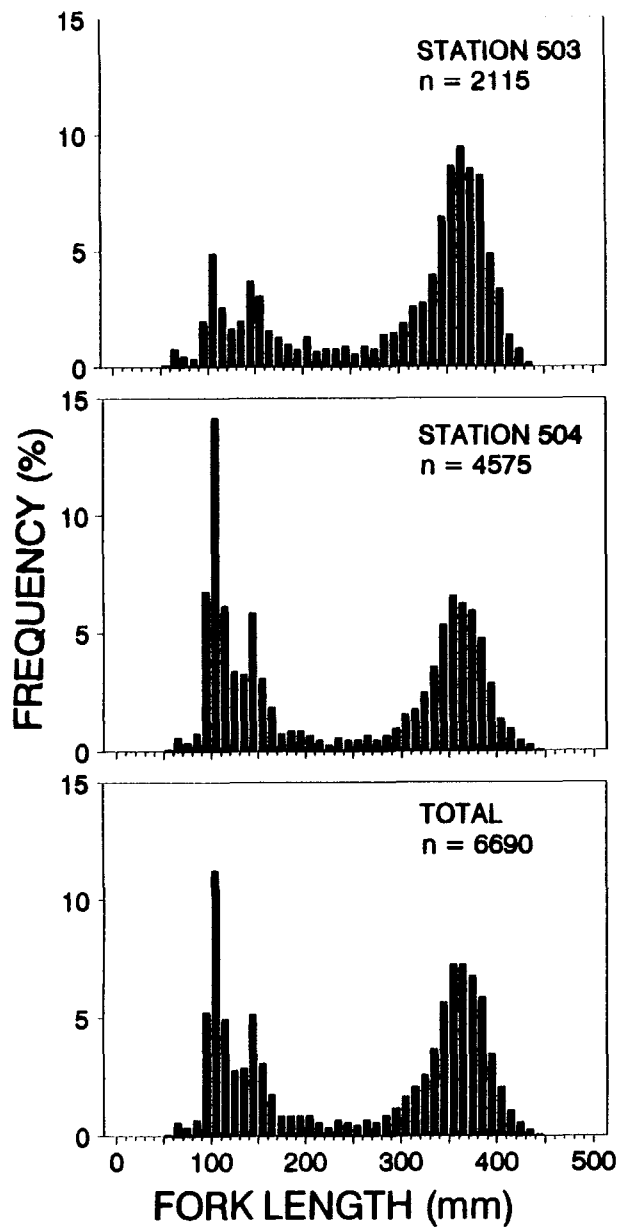


Fig. 8. Length-frequency distribution for Arctic cisco captured in trap nets at Wood Bay, 1990.

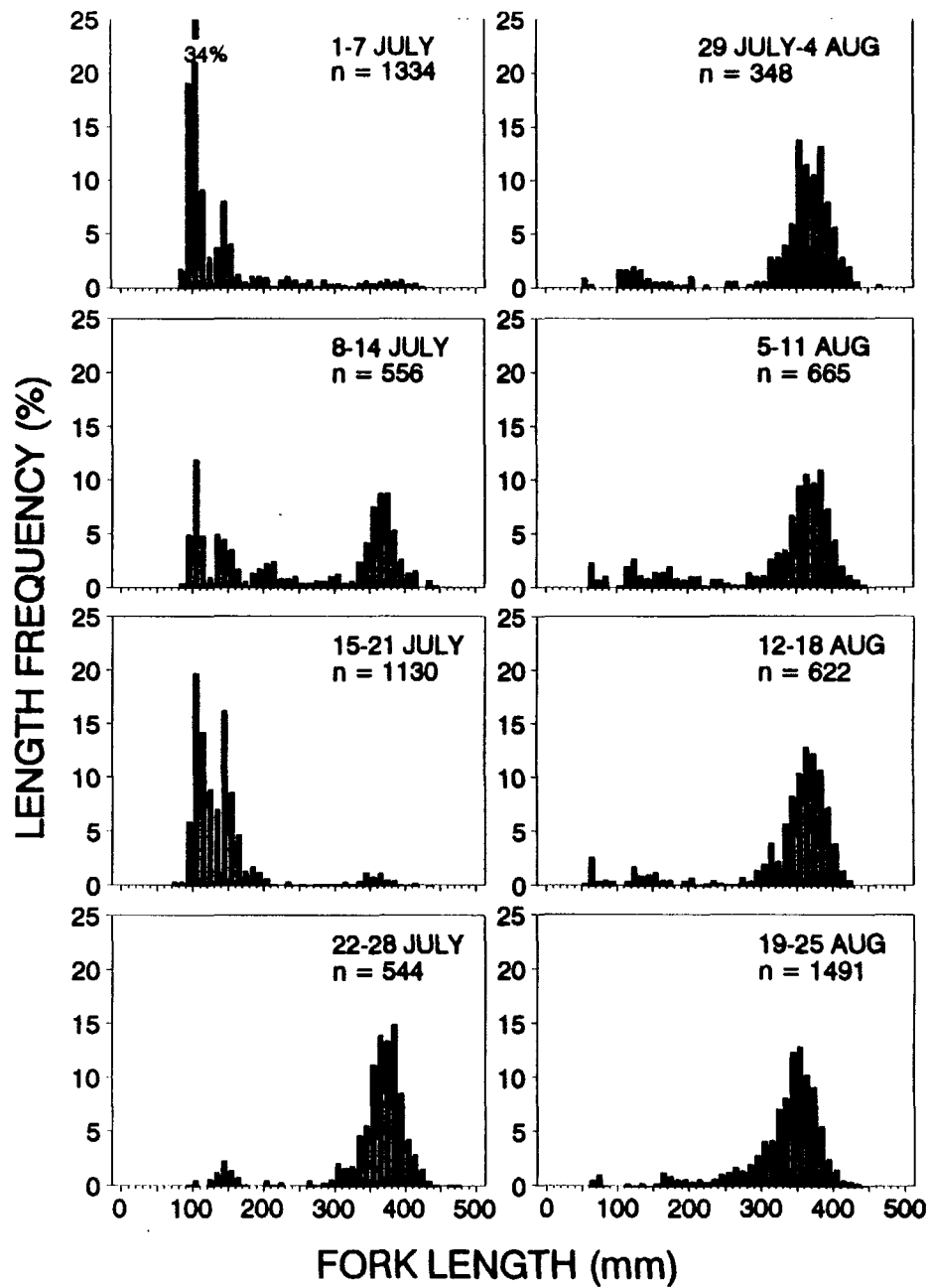


Fig. 9. Seasonal variation in length-frequency distribution of Arctic cisco captured in trap nets at Wood Bay during summer, 1990.

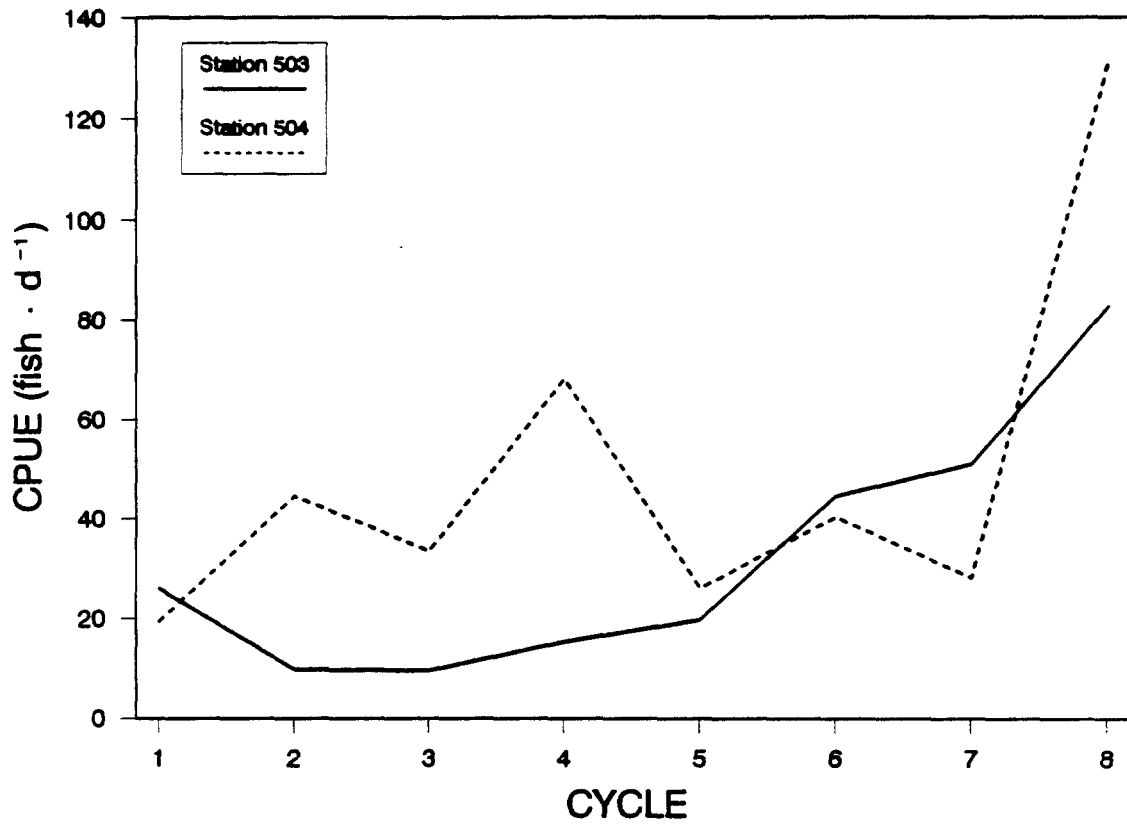


Fig. 10. Seasonal trends in CPUE for large Arctic cisco at Wood Bay, 1990.

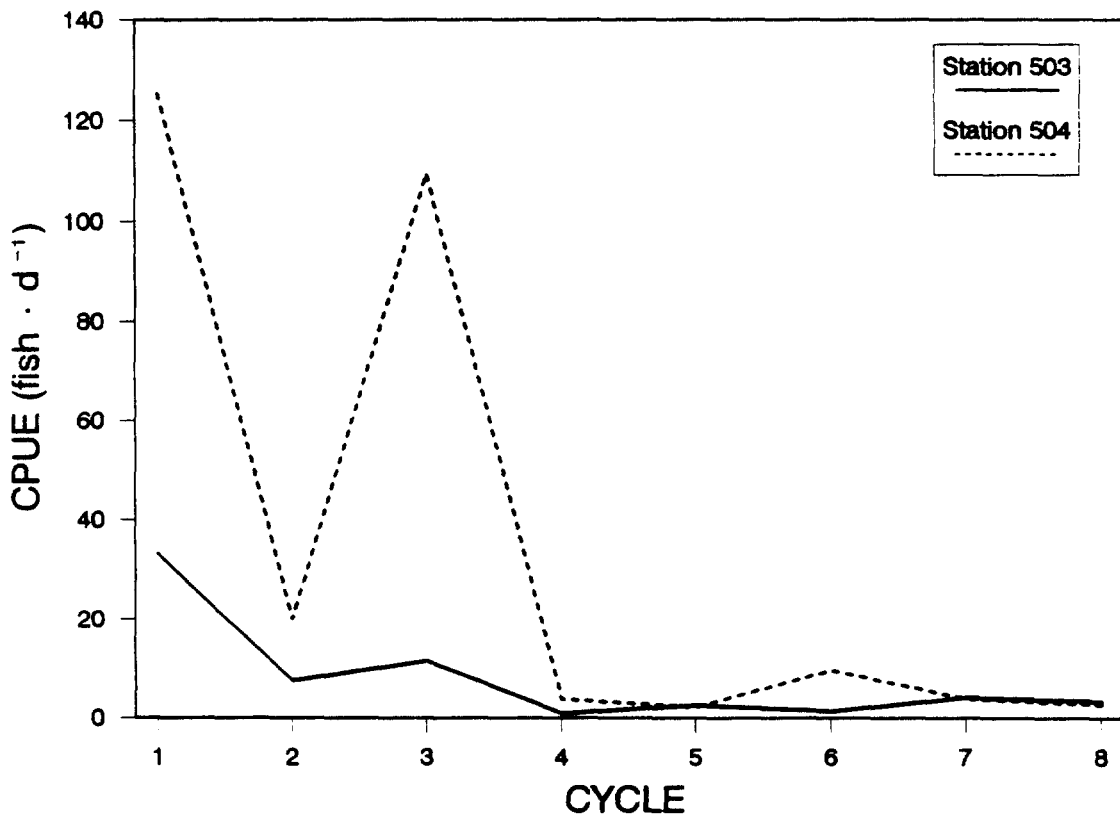


Fig. 11. Seasonal trends in CPUE for small Arctic cisco at Wood Bay, 1990.

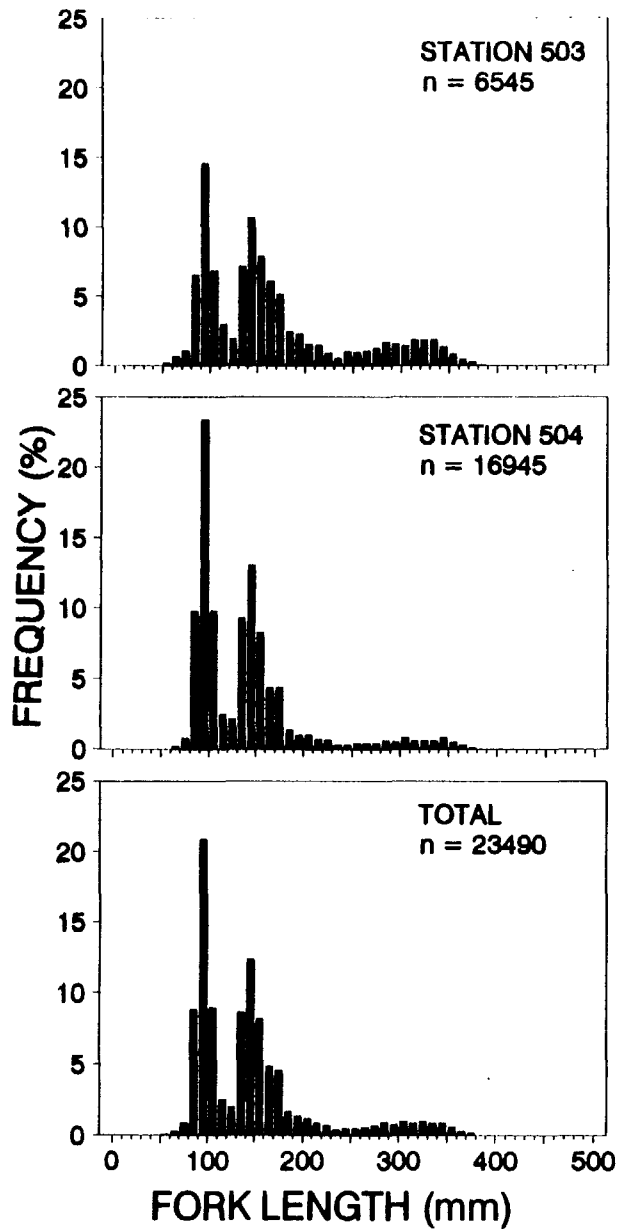


Fig. 12. Length-frequency distribution for least cisco captured in trap nets at Wood Bay, 1990.

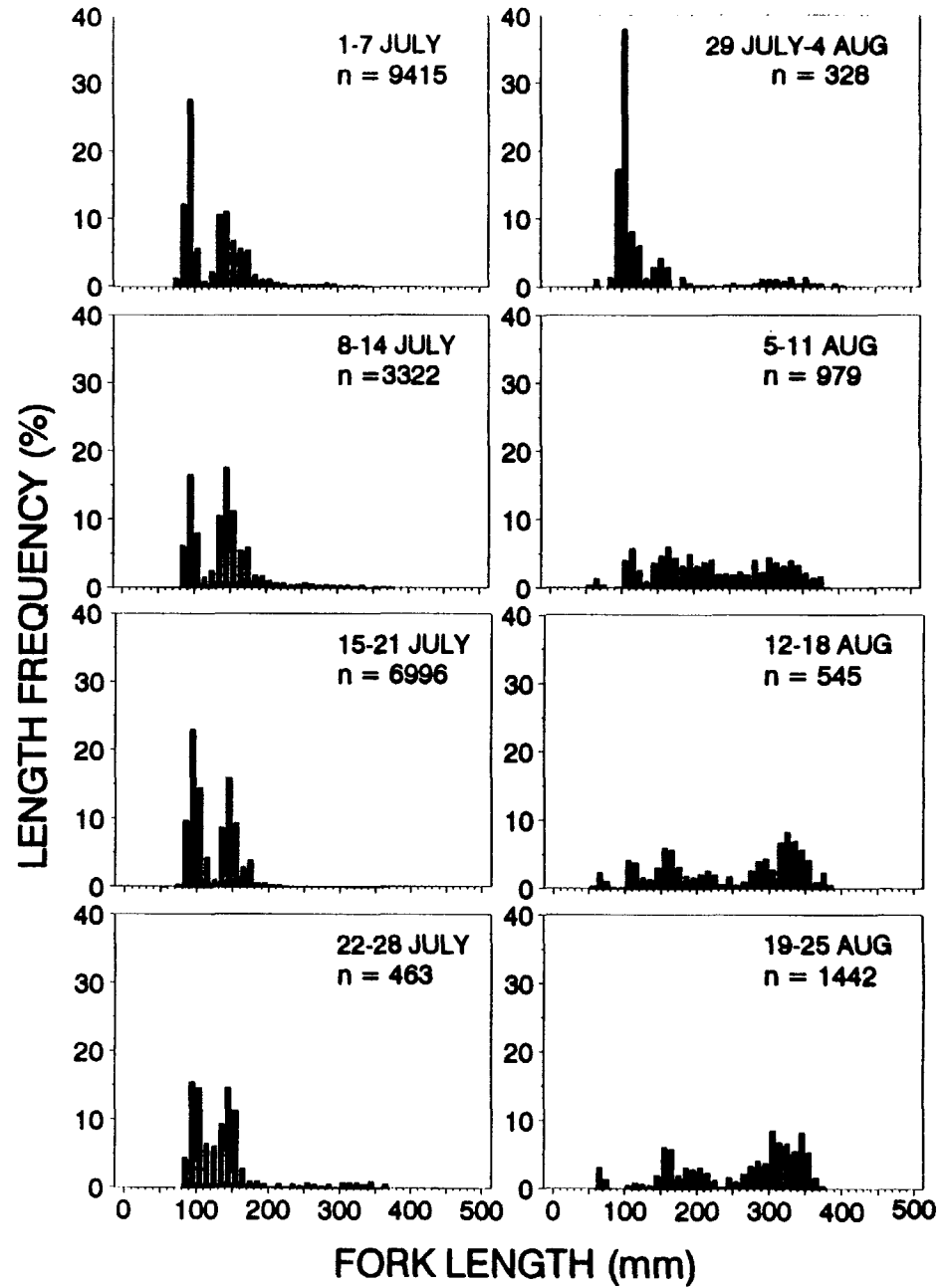


Fig. 13. Seasonal variation in length-frequency distribution of lease cisco captured in trap nets at Wood Bay during summer, 1990.

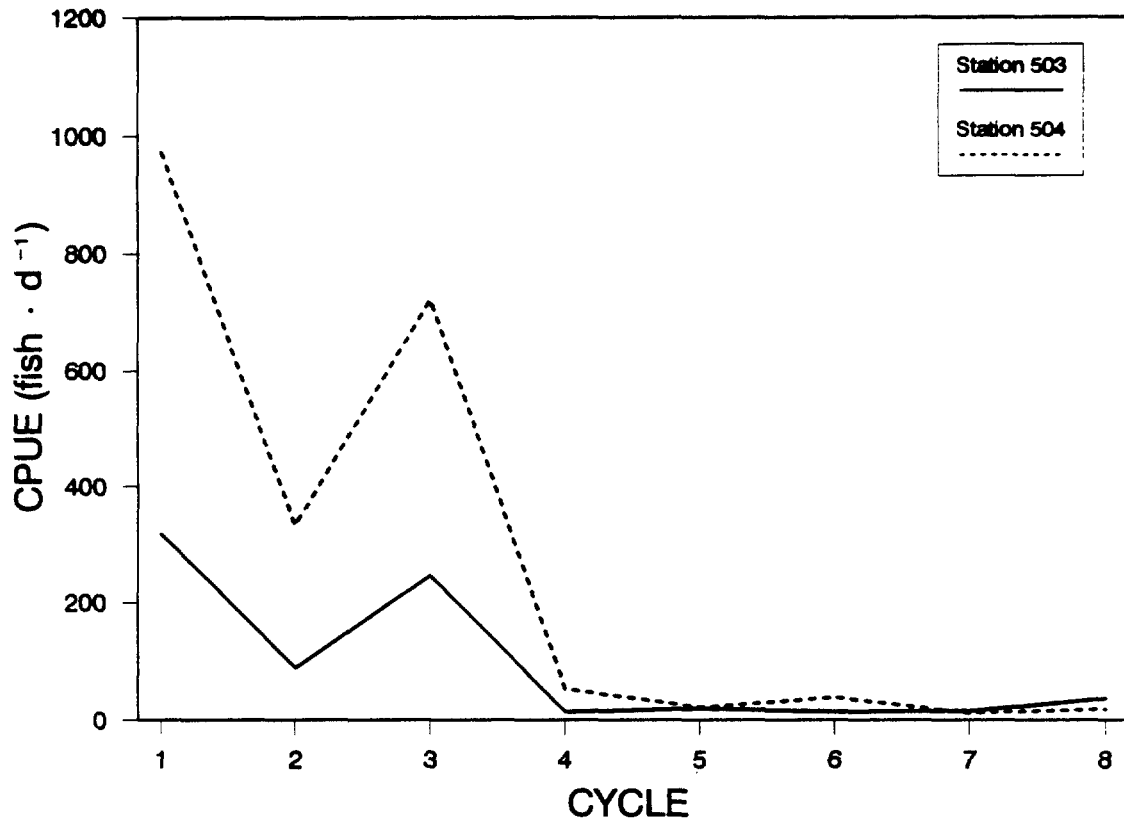


Fig. 14. Seasonal trends in CPUE for small least cisco at Wood Bay, 1990.

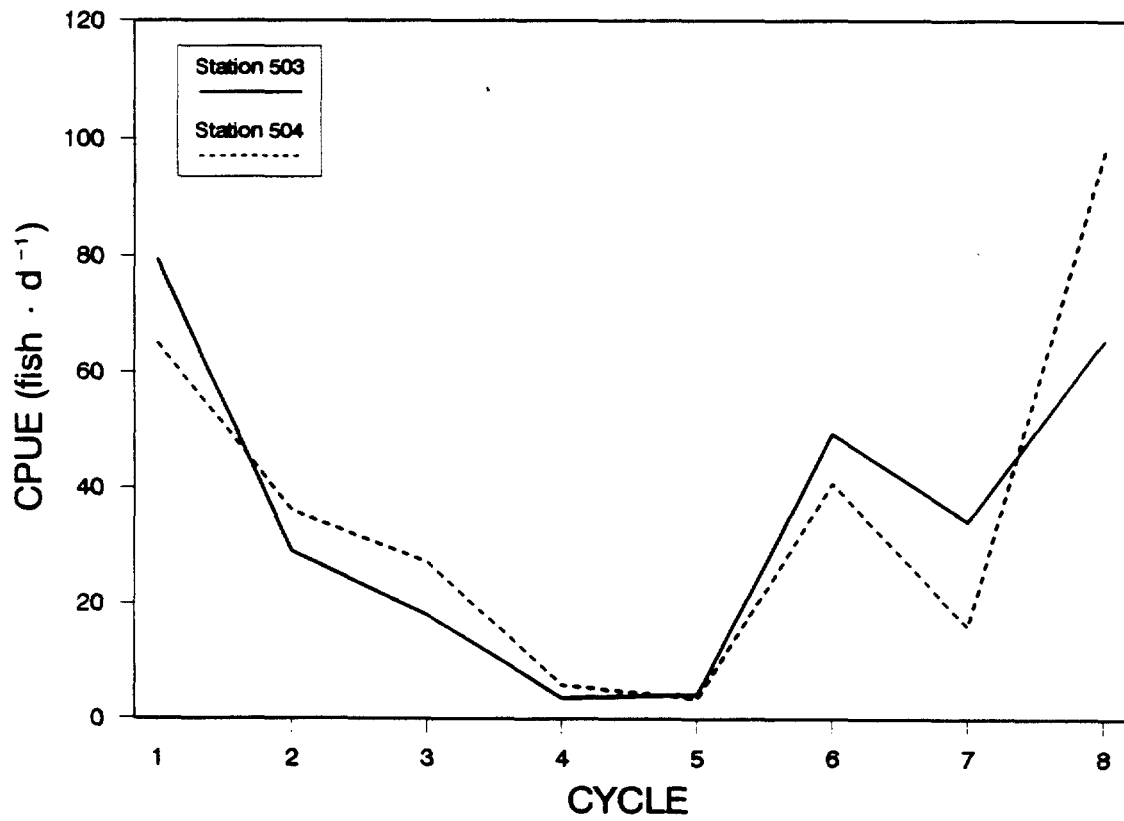


Fig. 15. Seasonal trends in CPUE for large least cisco at Wood Bay, 1990.

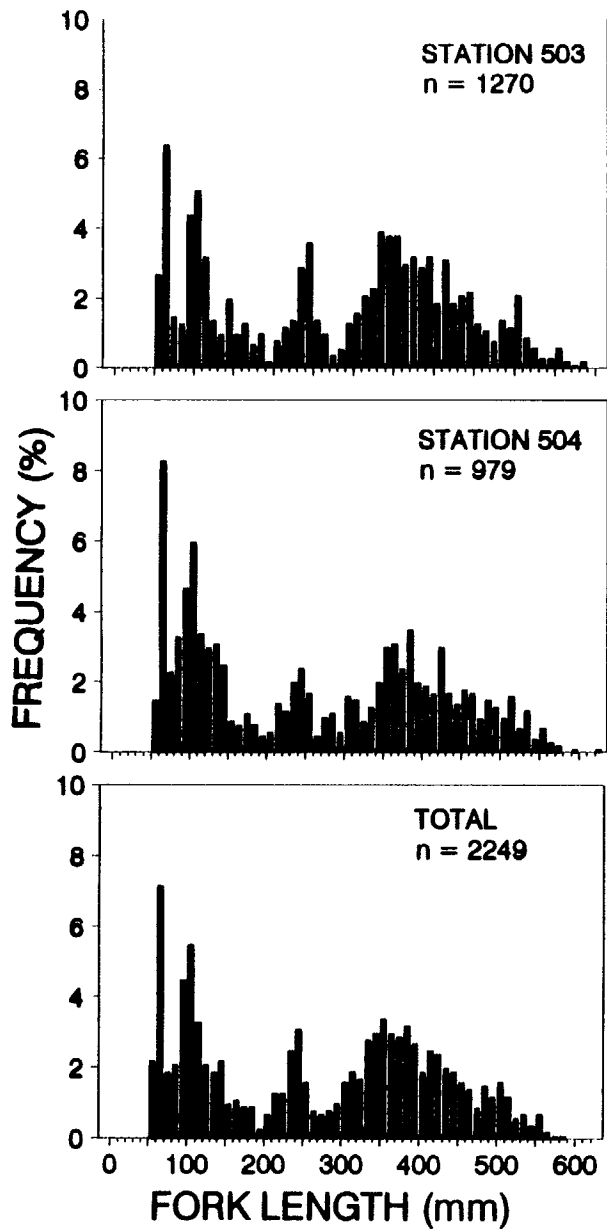


Fig. 16. Length-frequency distribution for broad whitefish captured in trap nets at Wood Bay, 1990.

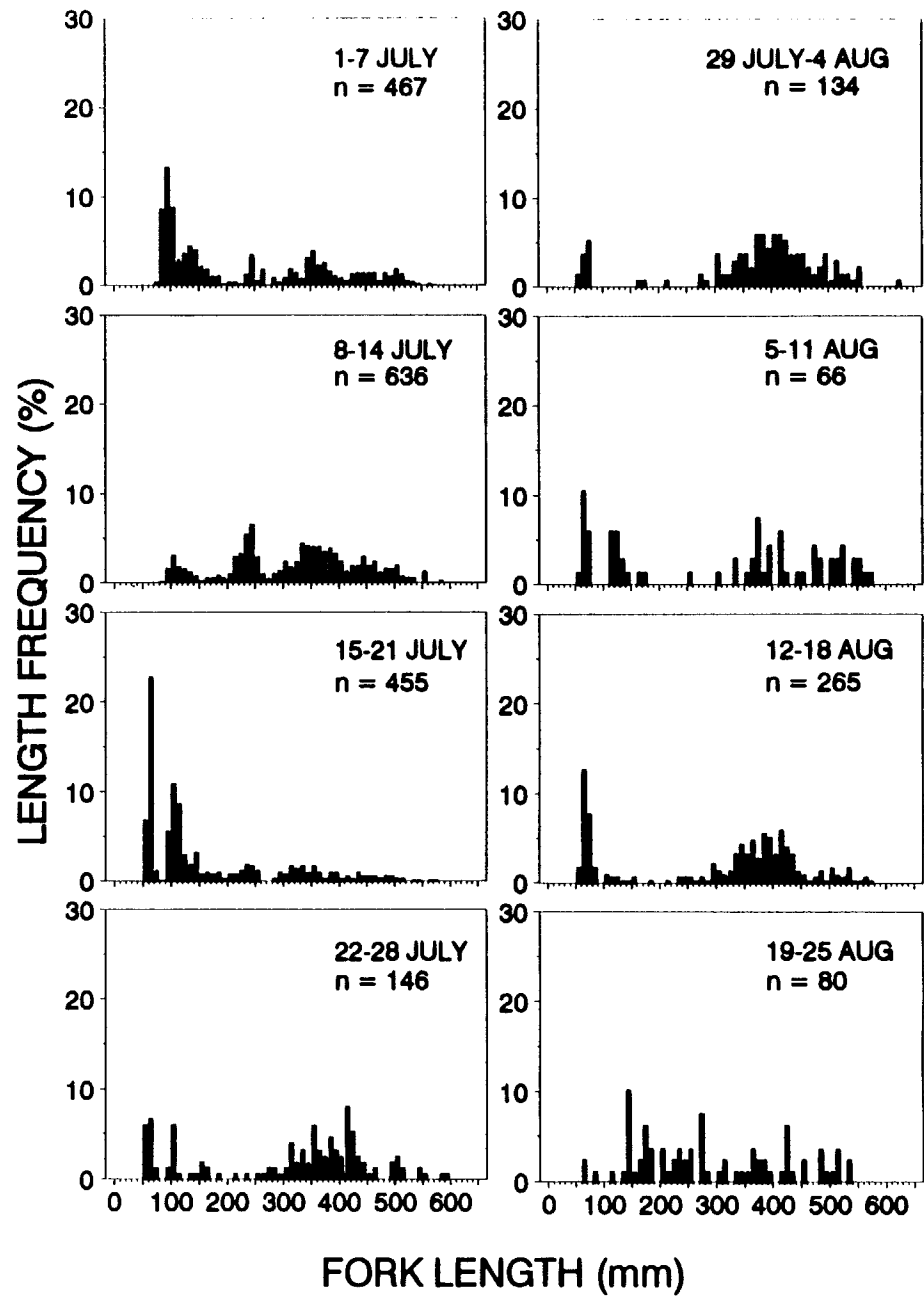


Fig. 17. Seasonal variation in length-frequency distribution of broad whitefish captured in trap nets at Wood Bay, 1990.

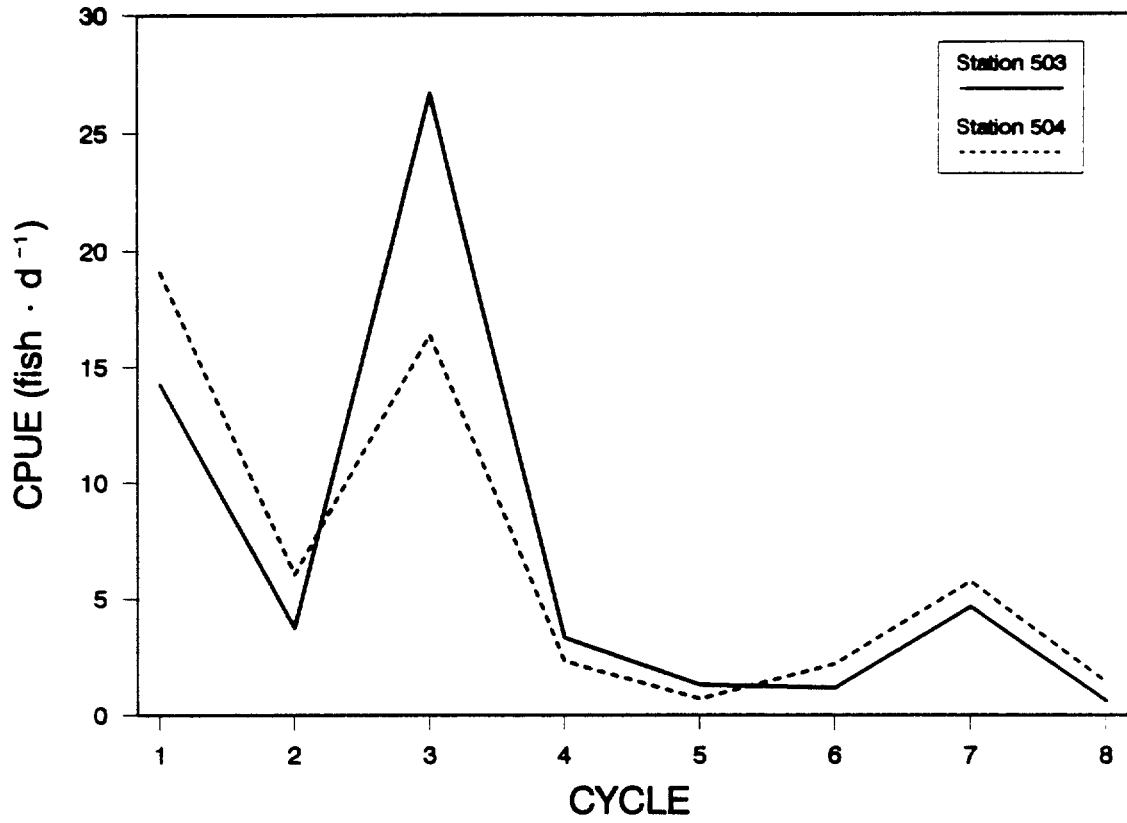


Fig. 18. Seasonal trends in CPUE for small broad whitefish at Wood Bay, 1990.

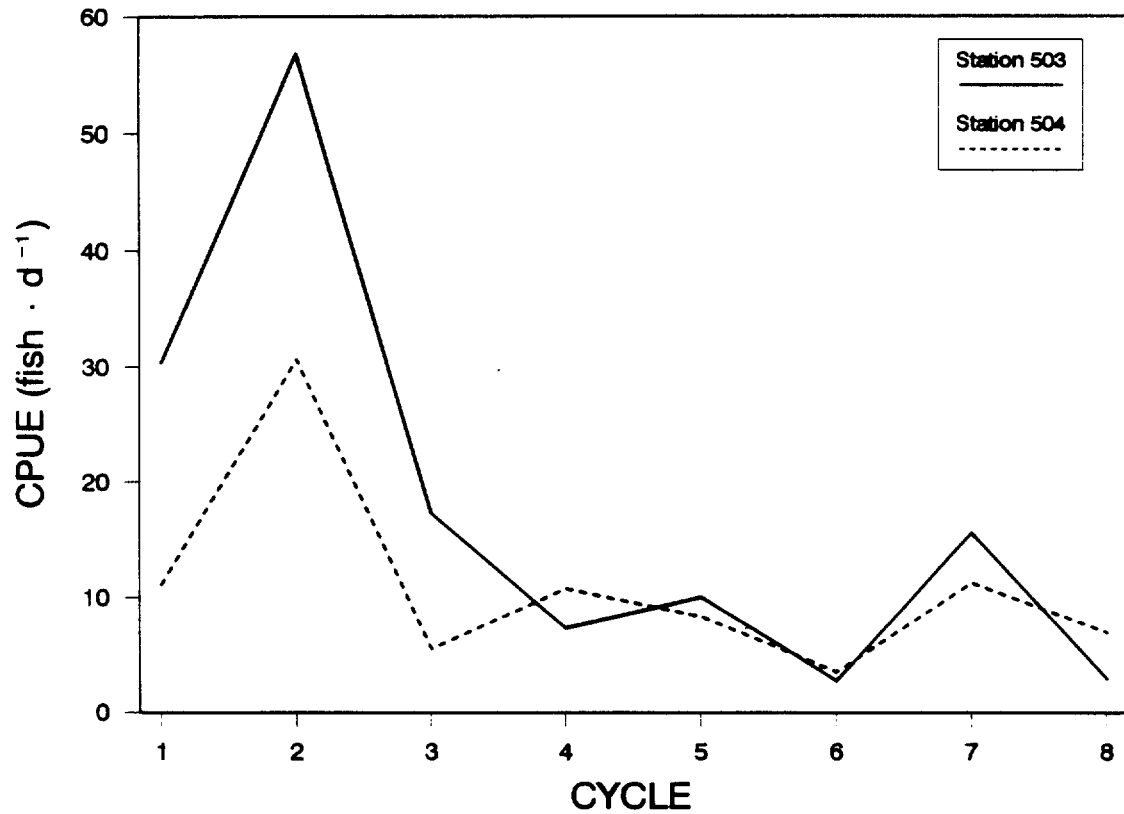


Fig. 19. Seasonal trends in CPUE for large broad whitefish at Wood Bay, 1990.

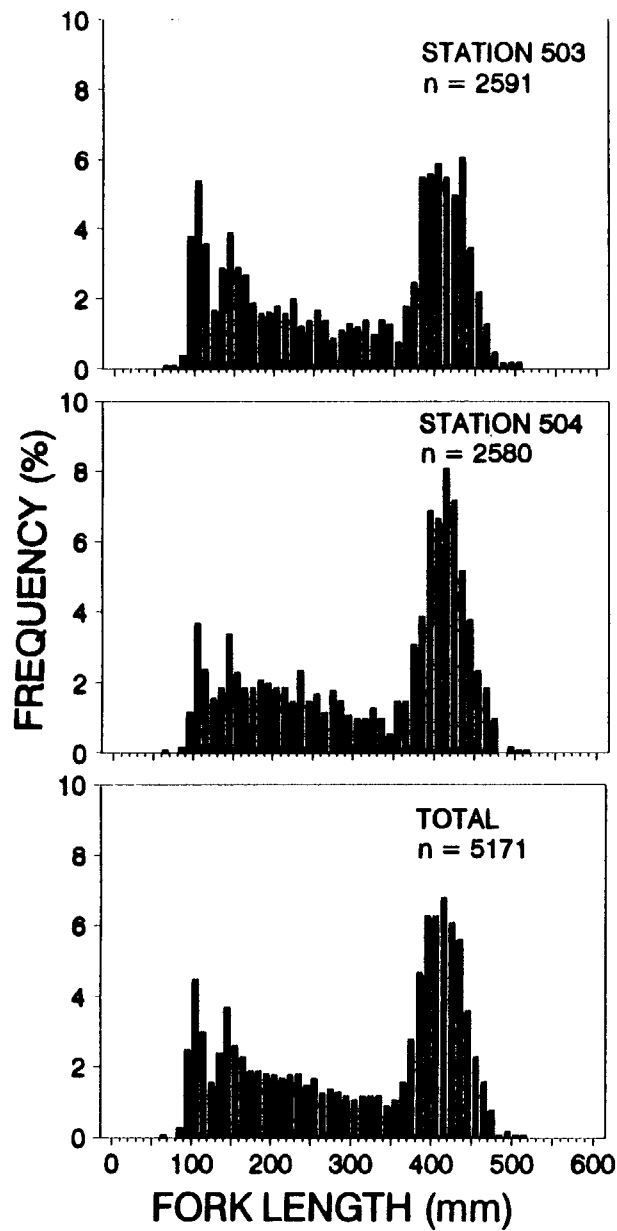


Fig. 20. Length-frequency distribution for lake whitefish captured in trap nets at Wood Bay, 1990.

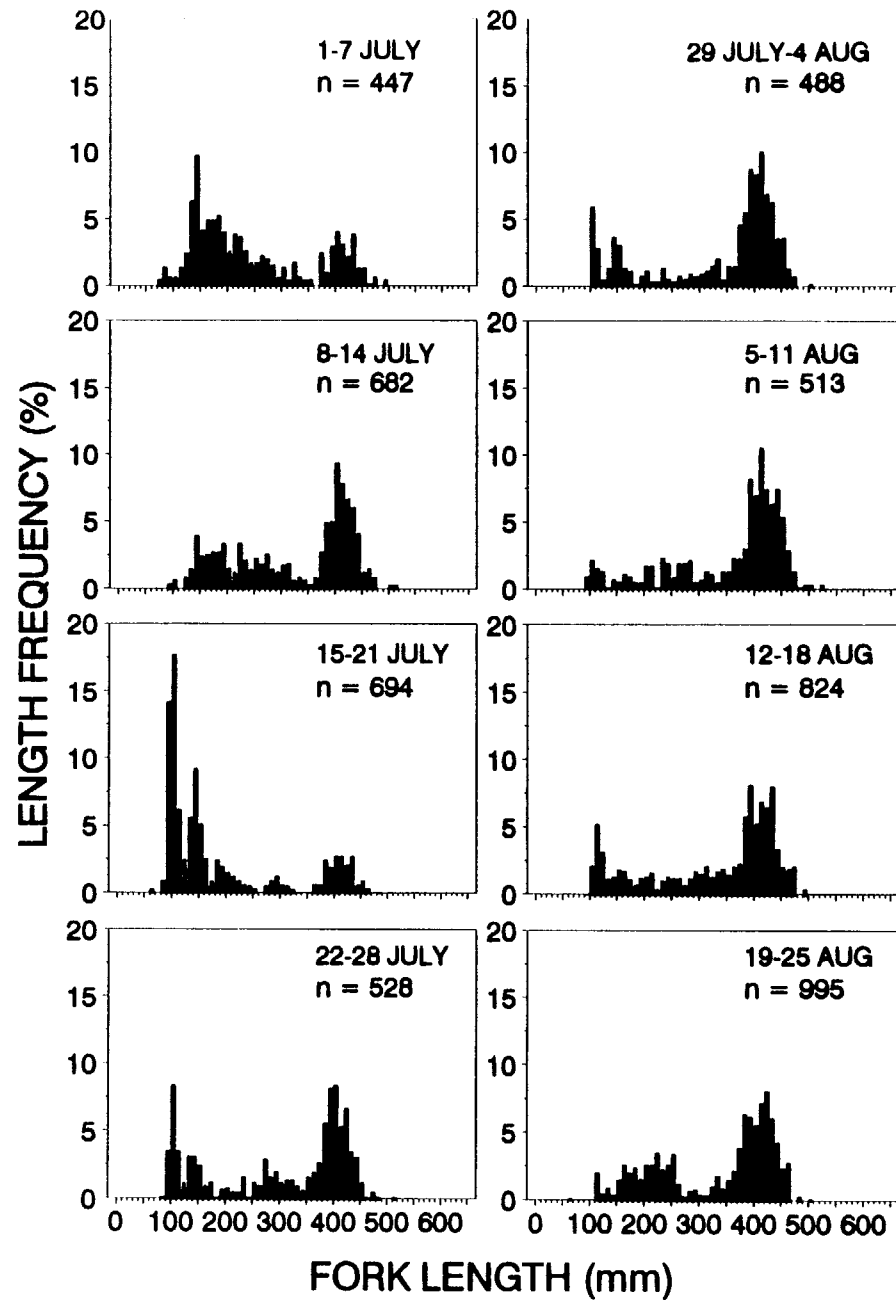


Fig. 21. Seasonal variation in length-frequency distribution of lake whitefish captured in trap nets at Wood Bay, 1990.

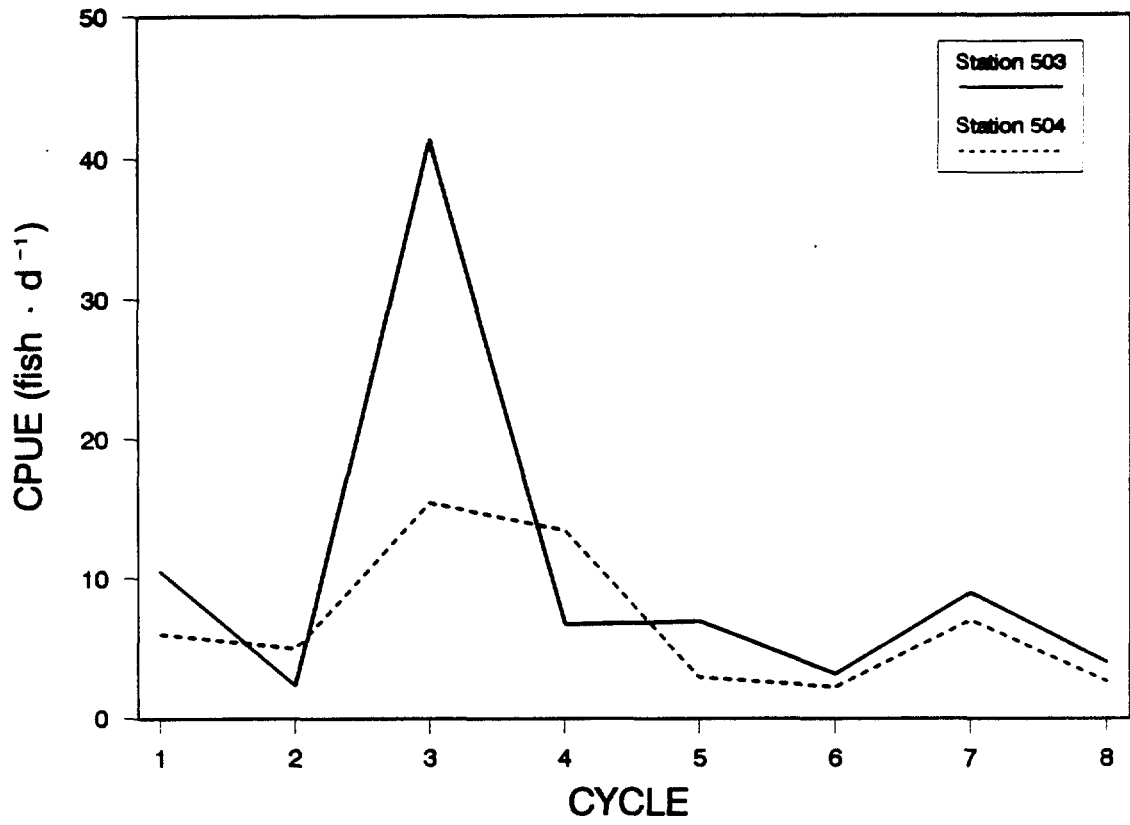


Fig. 22. Seasonal trends in CPUE for small lake whitefish at Wood Bay, 1990.

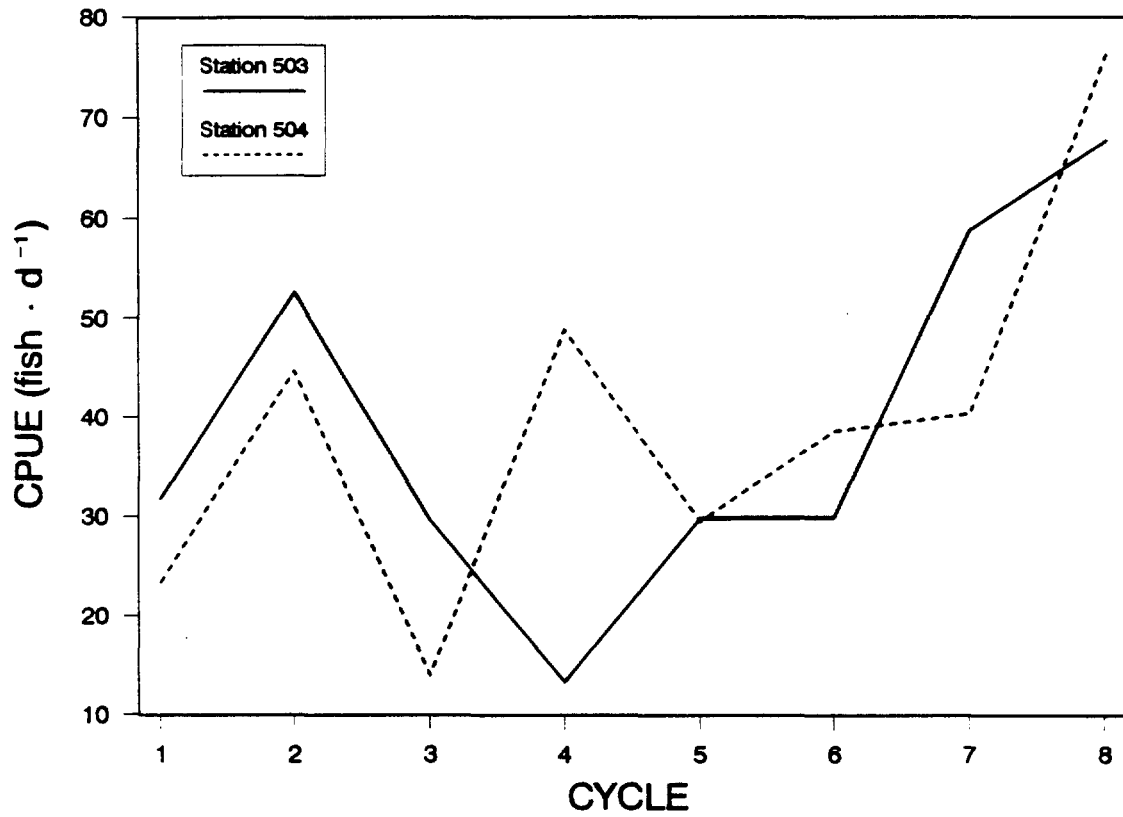


Fig. 23. Seasonal trends in CPUE for large lake whitefish at Wood Bay, 1990.

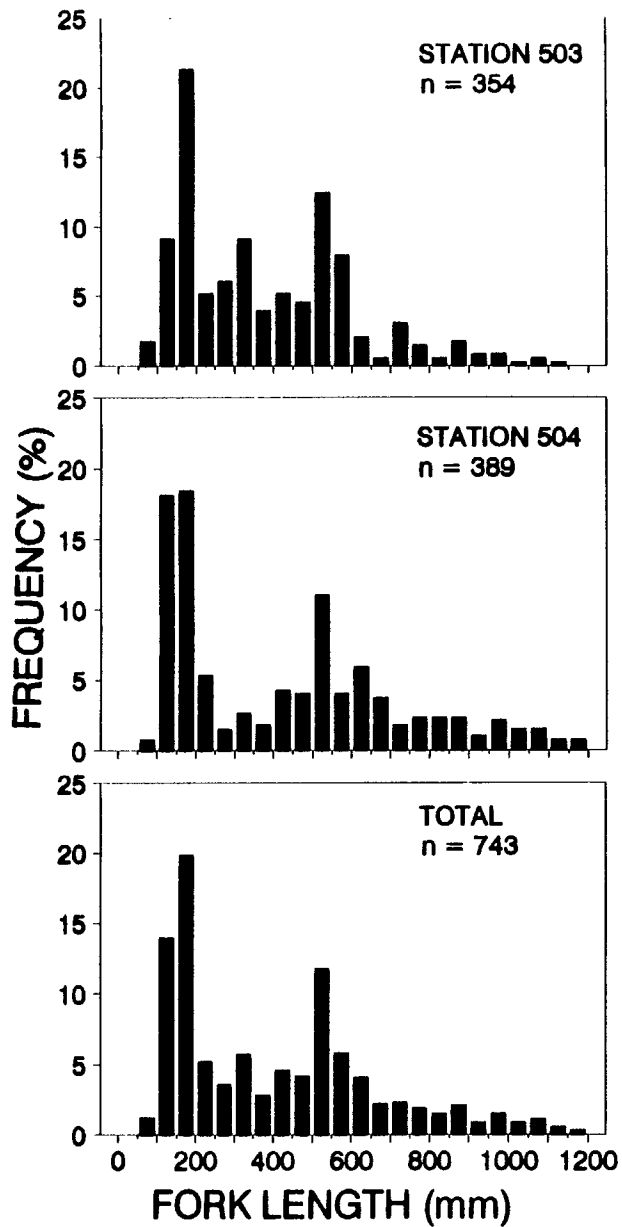


Fig. 24. Length-frequency distribution for inconnu captured in trap nets at Wood Bay, 1990.

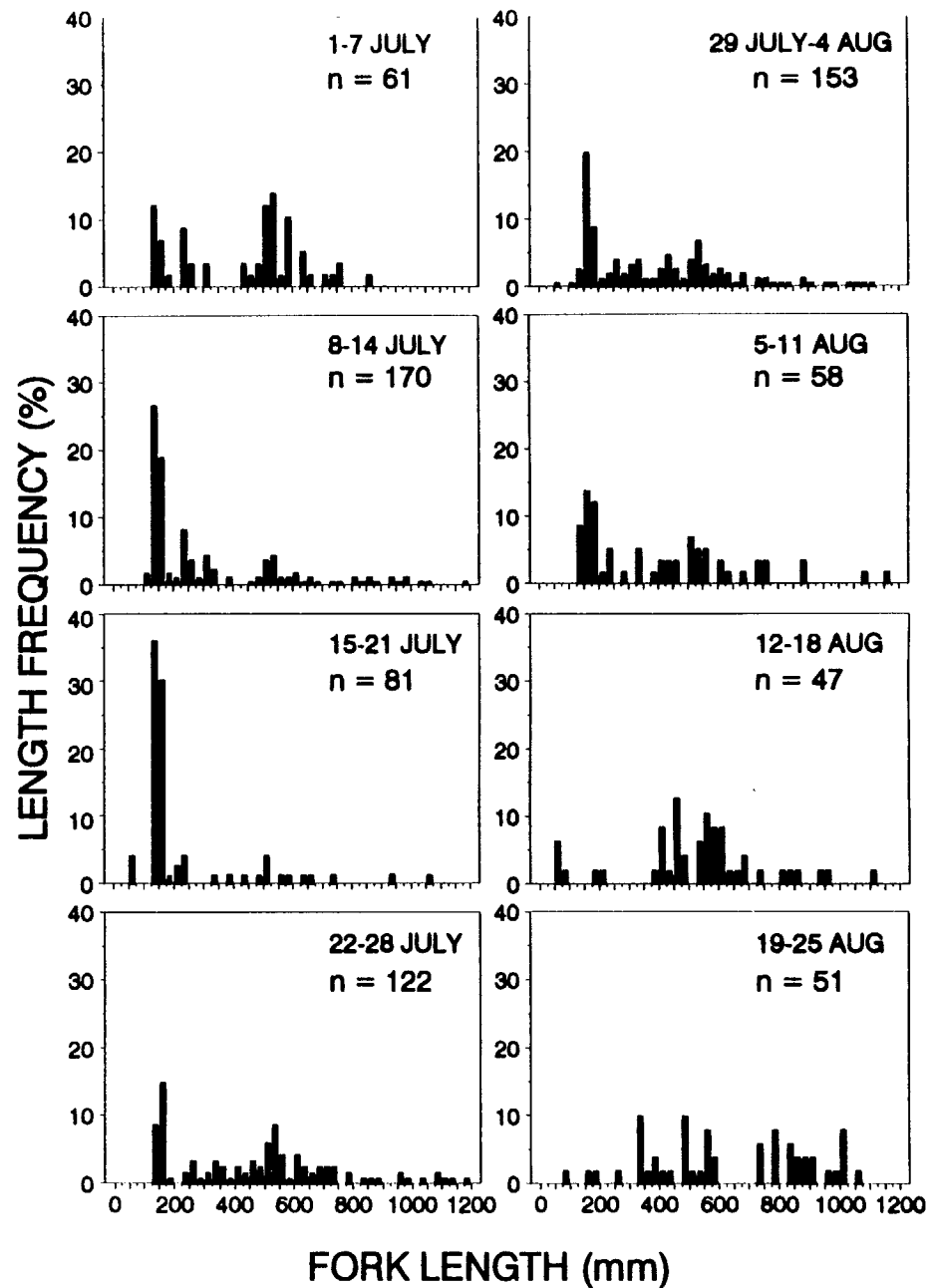


Fig. 25. Seasonal variation in length-frequency distribution of inconnu captured in trap nets at Wood Bay, 1990.

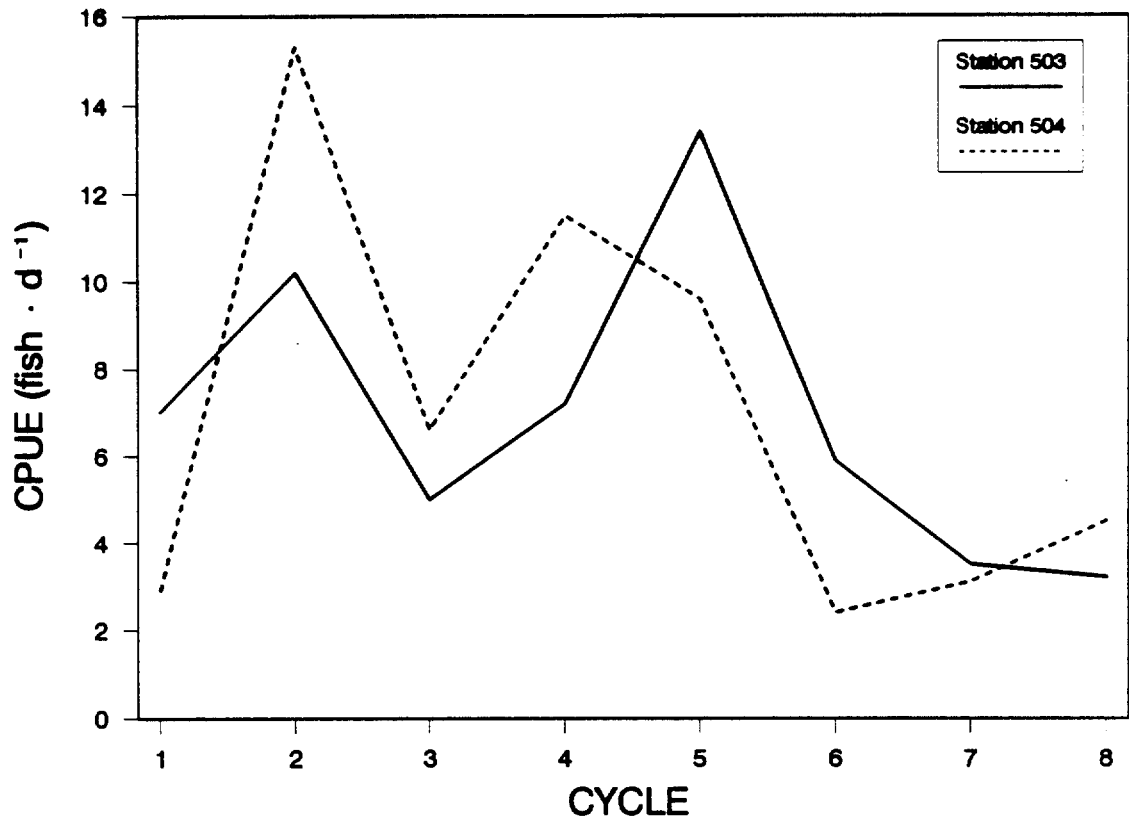


Fig. 26. Seasonal trends in CPUE for inconnu at Wood Bay, 1990.

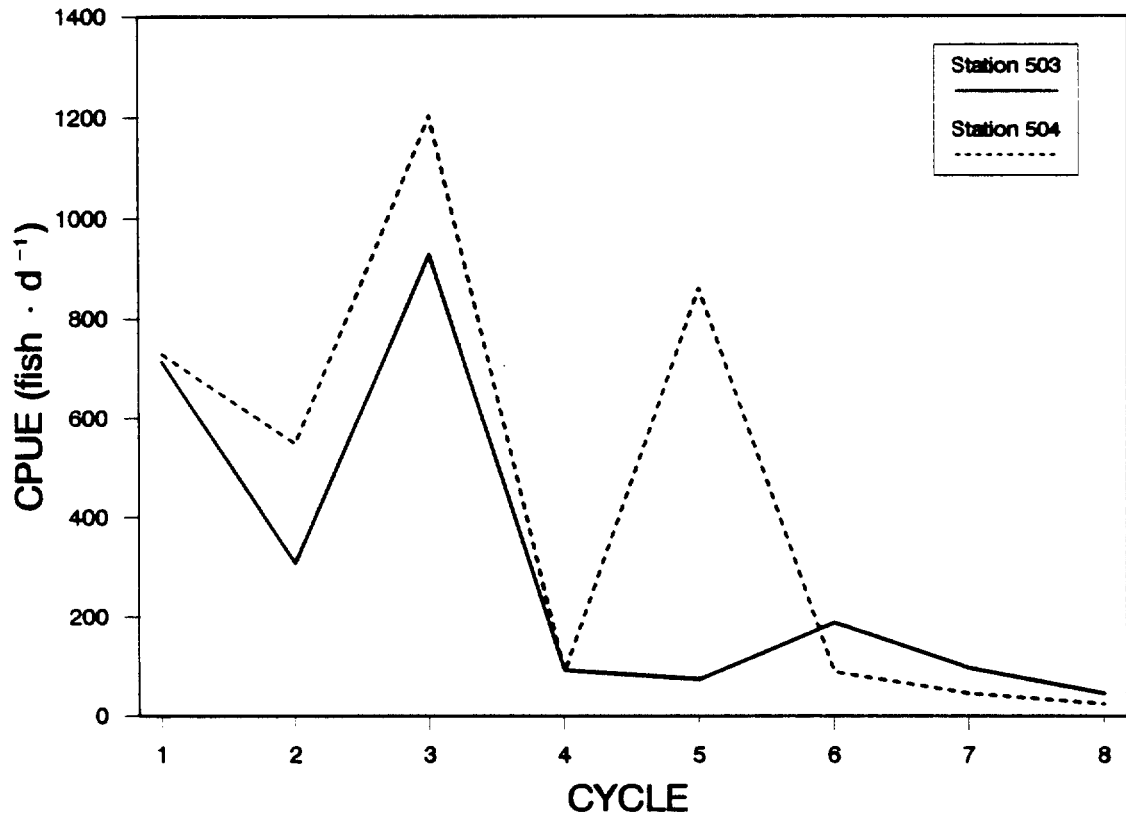


Fig. 27. Seasonal trends in CPUE for Arctic flounder at Wood Bay, 1990.

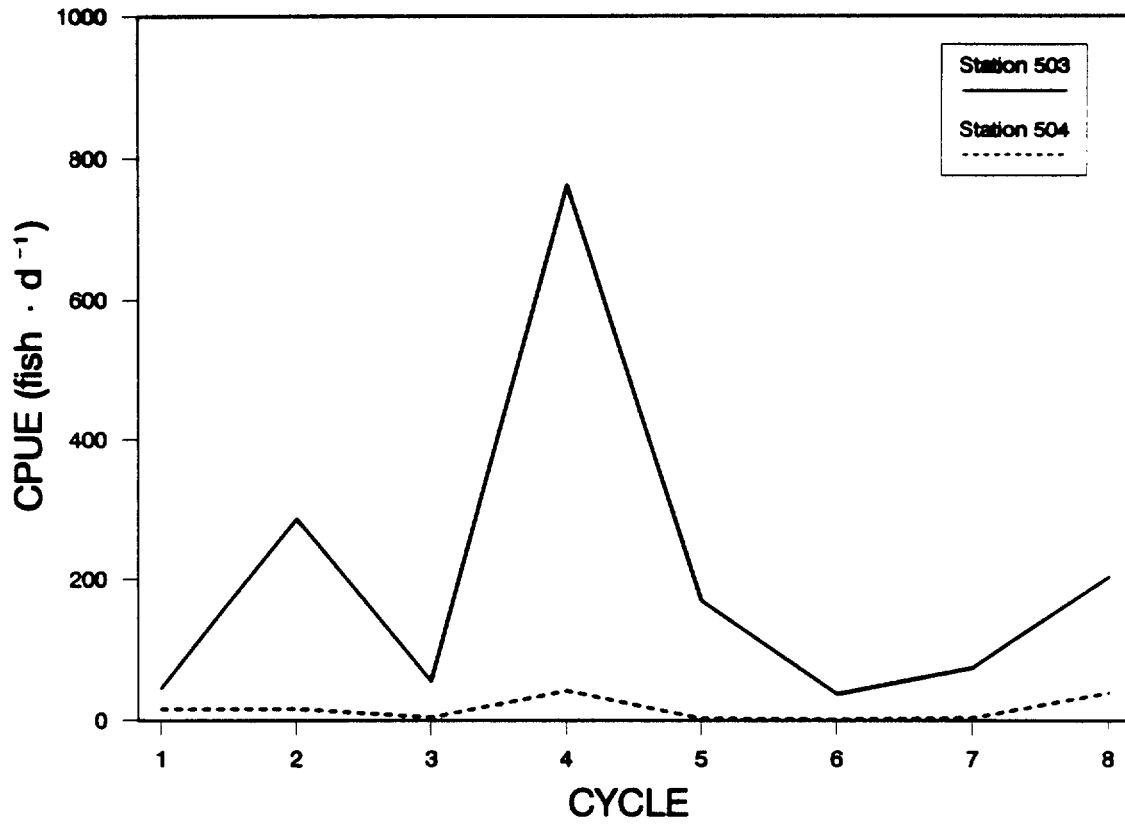


Fig. 28. Seasonal trends in CPUE for rainbow smelt at Wood Bay, 1990.

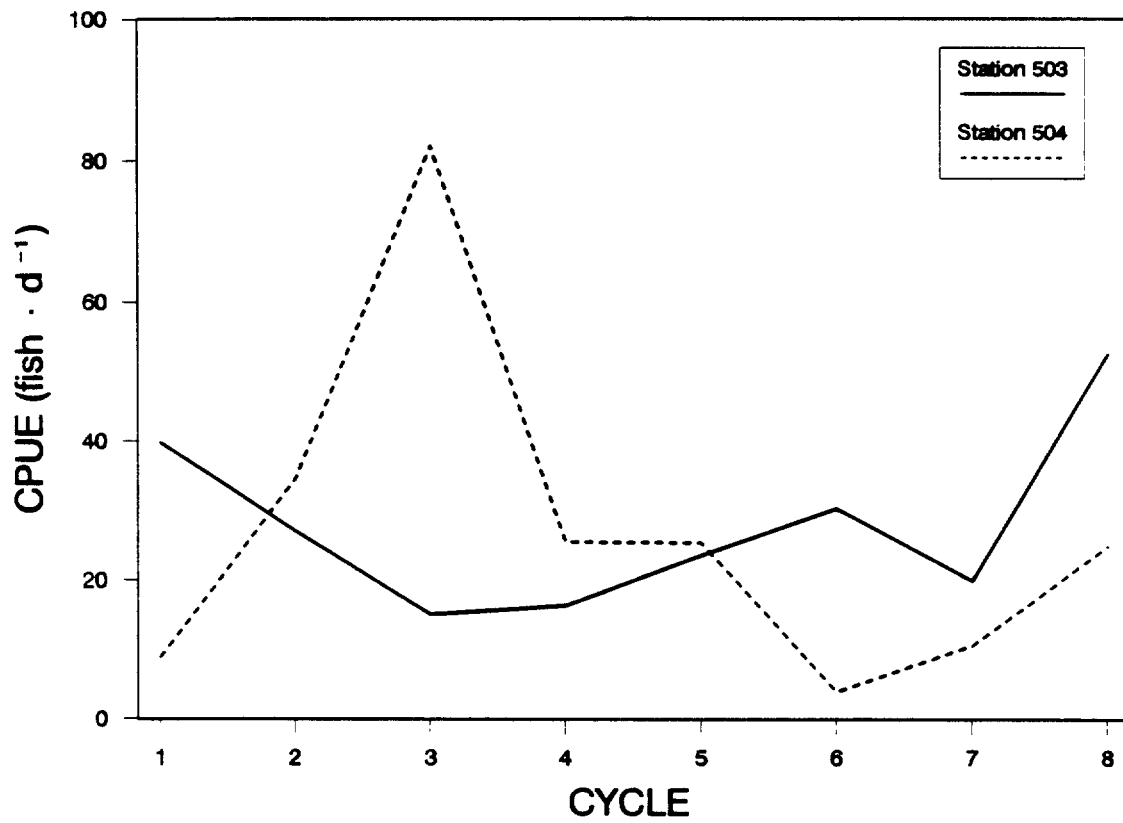


Fig. 29. Seasonal trends in CPUE for fourhorn sculpin at Wood Bay, 1990.

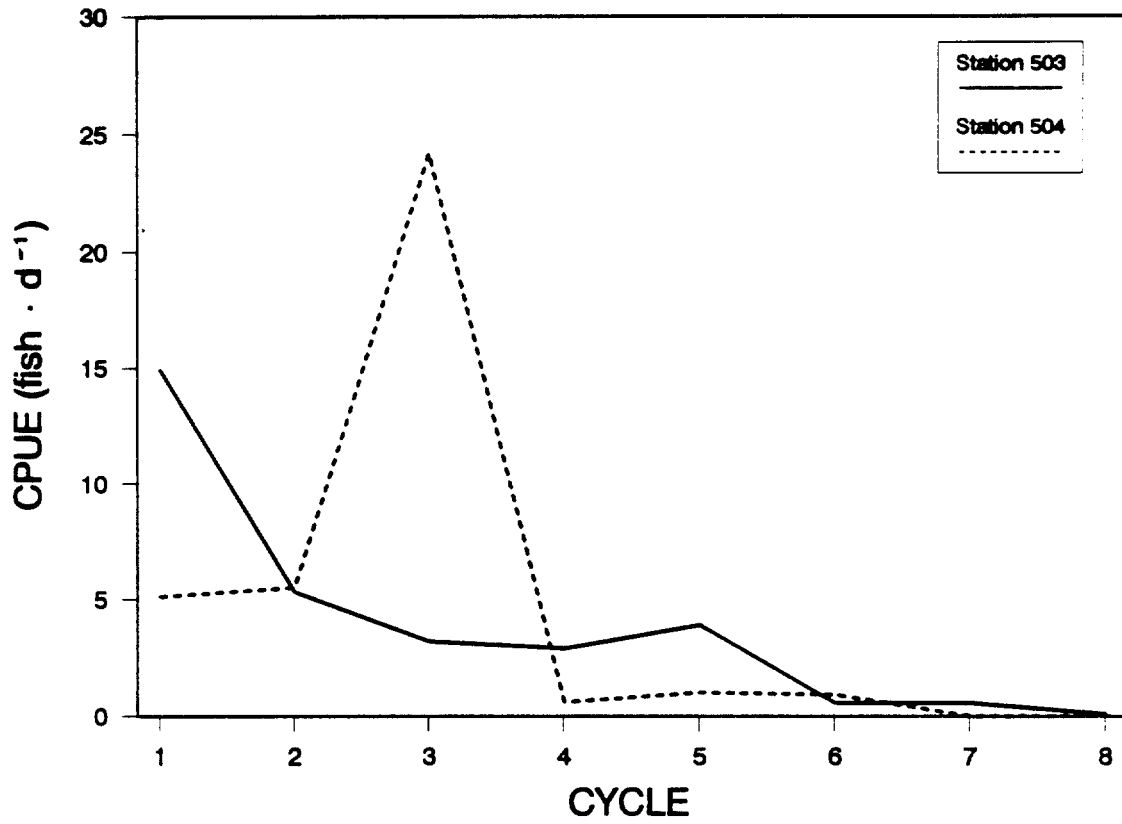


Fig. 30. Seasonal trends in CPUE for Pacific herring at Wood Bay, 1990.

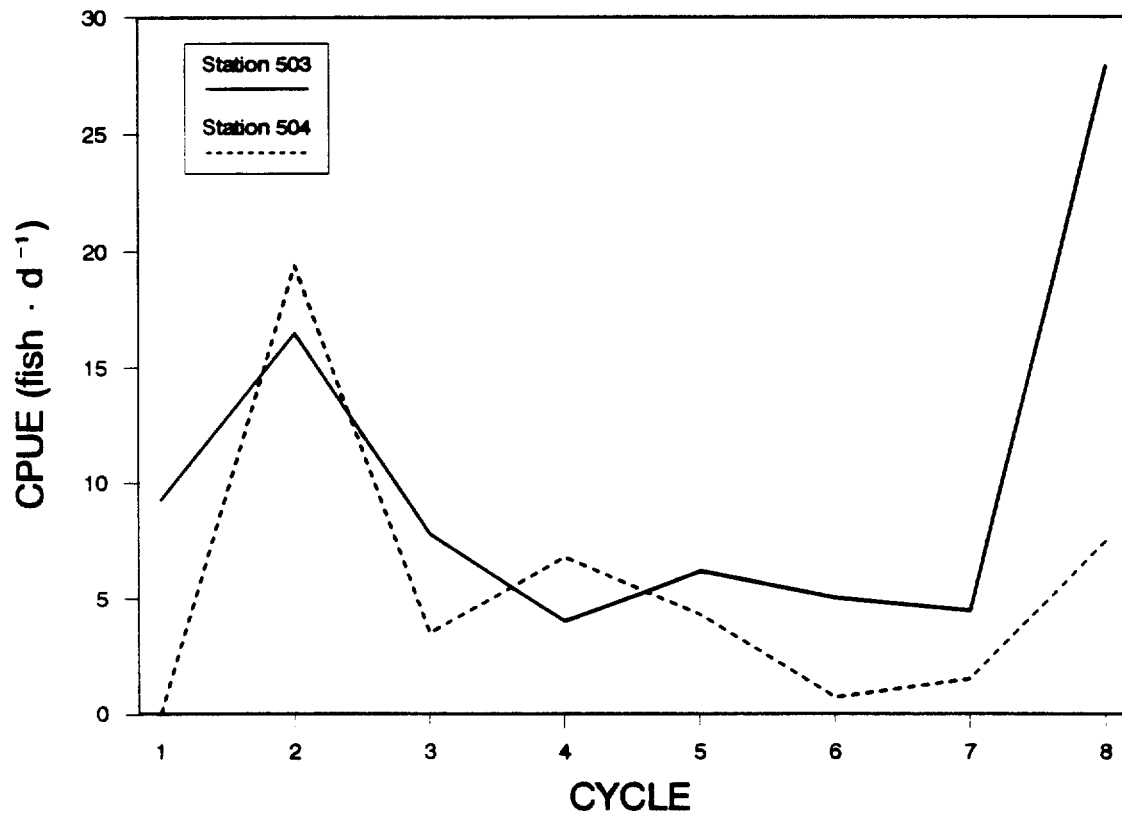


Fig. 31. Seasonal trends in CPUE for saffron cod at Wood Bay, 1990.

Appendix A1. Water temperature, salinity, and catch data from gillnet sets, Wood Bay, 1990.

Date	Site ¹	Number Captured by Species													Total	Set Duration (min)	Water Temp (°C)	Salinity (g·kg ⁻¹)	
		ARCS	LSCS	BDWT	LKWT	INCO	ARFL	RNSM	FHSC	LNSK	NRPK	STFL	BRBT	PCHR					SFCD
17 June	501	1		4	4	5		3								17	68	4.5	0.6
18	501	4	2	1	4	1										12	60	10.0	0.0
19	501	1	1	1	1	5		1								10	60	10.0	0.0
19	901				3	1										4	66	10.5	0.0
20	501	1	1	4	2	7										15	63	14.5	0.0
20	901	1		1	1	1										4	62	14.0	0.0
21	501	3		2	4	5		2								16	61	10.0	0.0
21	901						1	2	3							6	71	10.0	0.0
22	501	2	3	1		9	1									16	62	7.5	0.3
22	901								1							1	67	2.0	0.2
23	501	2	3			3	2									10	92	12.0	0.2
23	901						1	1	13							15	94	4.0	0.3
24	501	1	2	1		5				2						11	81	16.0	0.1
24	502															0	78	15.5	0.2
25	501	1		2	2	2		3		1	1					12	150	11.0	0.1
26	501	5	6	10	7	18	1	17		1	1	3				69	91	12.0	0.1
26	503	2	3	1	1	3	2	7	1							20	355	6.0	0.2
27	501	1	4	3	3	8		2				3				24	120	13.5	0.1
27	502		3					1								4	60	6.5	0.1
28	501	1		3	1	2		1								9	70	13.5	0.0
28	503	10	1	6	3	1			6							27	65	2.5	0.3
29	501	7	1	4	2	10	1			1	1	1				28	60	13.0	0.2
29	503	11	4	2	3	1	2		4							27	65	5.0	1.5
30	501		1			1	1	2				2	1			8	60	12.0	0.2
30	503	14	7	8	10	12			45					4		100	205	6.5	1.4
8 July	903															0	195	11.8	3.5
8	904								1							1	125	8.5	4.0
15	903						11		86						15	112	200	13.0	5.8
15	904								6							6	110	13.0	6.2
16	501		1		6	1										8	60	21.0	0.0
29	903						5	1	8						5	19	111	11.0	6.8
29	904								2							2	95	11.0	9.7
12 Aug.	903						23	1	6							30	75	10.0	14.7
12	904						7	1	26						3	37	80	9.0	15.4
28	501	23	6	2	8	6			6							51	60	6.5	4.9
29	501	12	5		9	10			3							39	60	6.5	4.3
Total		103	54	56	74	117	58	45	217	5	3	10	1	4	23	770	3457		

¹ Stations 901, 903 and 904 were located offshore (mid-bay) from Stations 501, 503 and 504.

Appendix A2.1. Daily catch of small (<150 mm) Arctic cisco by codend trap, Wood Bay, 1990.

Date	Number by station and side of trap ¹						Grand total
	Station 503			Station 504			
	01	02	Total	01	02	Total	
1 July	ND	ND	ND	257	35	292	292
2	105	10	115	66	17	83	198
3	12	1	13	31	16	47	60
4	3	2	5	10	6	16	21
5	7	14	21	113	16	129	150
6	36	1	37	229	8	237	274
7	1	1	2	42	11	53	55
8	3	24	27	37	37	74	101
9	1		1	6	8	14	15
10		3	3	27		27	30
11	9	ND	9	ND	ND	ND	9
12	ND	ND	0	5	2	7	7
13			0	7	3	10	10
14	1		1	8	1	9	10
15	3		3	6	3	9	13
16	7	6	13	60	98	158	171
17	14	10	24	256	3	259	283
18	9	1	10	92	1	93	103
19	17	2	19	54	1	55	74
20	6	1	7	131	1	132	139
21		2	2	49		49	51
22		1	1	3		3	4
23		ND	0	ND		0	0
24	1		1			0	1
25	1		1	1	1	2	3
26		ND	0	11	2	13	13
27	2		2	2	1	3	5
28	1		1	1	1	2	3
29	7	4	11	5		5	16
30	3	1	4	2	1	3	7
31	1		1	2	2	2	3
1 August			1			0	1
2			0		1	1	1
3			0	1		1	1
4		ND	0	3		3	3
5			0	2	1	3	3
6			0		1	1	1
7	1		1			0	1
8			0	2		2	2
9	1	2	3	9	18	27	30
10	3	1	4	1	24	25	29
11		1	1	5	3	8	9
12	5		5	5		5	10
13	3		3	1	2	3	6
14			0			0	0
15	3		3	1		1	4
16	2	1	3	7	1	8	11
17		11	11	10	10	10	21
18	1	3	4			0	4
19		1	1	2	1	3	4
20	2		2	2	2	2	4
21		3	3	1	5	6	9
22	1	1	2	2	2	2	4
23	3		3	1	2	3	6
24	6	ND	6			0	6
25	3	2	5		2	2	7
Total	285	111	396	1552	350	1902	2298

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A2.2. Daily catch of large (≥150 mm) Arctic cisco by codend trap, Wood Bay, 1990.

Date	Number by station and side of trap ¹						Grand total
	Station 503			Station 504			
	01	02	Total	01	02	Total	
1 July				21	2	23	23
2	40	3	43	19	2	21	64
3	22	27	49	6	2	8	57
4	7		7	2	2	4	11
5	18	12	30	37	4	41	71
6	15	2	17	24		24	41
7	3	2	5	12		12	17
8	5	1	6	10	5	15	21
9			0	7		7	7
10	6	2	8	33	1	34	42
11	4	ND	4	ND	ND	ND	4
12	3	ND	3	64	23	87	90
13	13	5	18	70	21	91	109
14	8	13	21	71	9	80	101
15	27	3	30	17	4	21	51
16	8	6	14	107	5	112	126
17	10	3	13	51		51	64
18	4	1	5	10	2	12	17
19		2	2	4	1	5	7
20	2		2	17		17	19
21			0	12		12	12
22	9	3	12	35	2	37	48
23	7	ND	7	ND	3	3	10
24	1		1	21	9	30	31
25	1	4	5	21	4	25	30
26	9	ND	9	109	14	123	132
27	5	4	9	91	15	106	115
28	37	16	53	85	10	95	148
29	17	11	28	63	6	69	97
30	15	10	25	9	3	12	37
31	42	5	47	29		29	76
1 August	10	7	17	8	6	14	31
2	8	4	12	26	8	34	46
3	2	1	3	9	7	16	19
4	2	ND	2		9	9	11
5		25	25	17	66	83	108
6	29	37	66	8	18	26	92
7	21	21	42	8	42	50	92
8	29	60	89	8	25	33	122
9	10	19	29	3	12	15	44
10	12	9	21	28	16	44	65
11	15	23	38	19	10	29	67
12	30	14	44	28	37	65	109
13	15	31	46	21	24	45	91
14	7	54	61	10	38	48	109
15	18	80	98	5	23	28	126
16	7	28	35	1	5	6	41
17	1	9	10	1	6	7	17
18	11	60	71	2		2	73
19	16	29	45	6	9	15	60
20	37	38	75	39	65	104	179
21	23	36	59	38	41	79	138
22	17	29	46	15	67	82	128
23	29	29	58	10	93	103	161
24	82	ND	82	128	152	280	362
25	88	85	173	148	102	250	423
Total	857	862	1719	1643	1030	2673	4392

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A2.3. Daily catch of small (<180 mm) least cisco by codend trap, Wood Bay, 1990.

Date	Number by station and side of trap ¹						Grand Total
	Station 503			Station 504			
	01	02	Total	01	02	Total	
1 July				1390	82	1472	1472
2	565	58	623	608	21	629	1252
3	396	107	503	531	128	659	1162
4	35	40	75	196	40	236	311
5	230	99	329	956	49	1005	1334
6	220	36	256	1901	31	1932	2188
7	53	12	65	659	65	724	789
8	97	145	242	448	168	616	858
9	71	10	81	307	77	384	465
10	35	12	47	616	51	667	714
11	36	ND	36	ND	ND	ND	36
12	63	ND	63	206	219	425	488
13	9	30	39	83	58	141	180
14	22	8	30	89	27	116	146
15	19	1	20	20	20	40	60
16	31	61	92	388	778	1166	1258
17	45	92	137	278	58	336	473
18	72	16	88	133	6	139	227
19	695	7	702	645	41	686	1388
20	383	16	399	1590	13	1603	2002
21	253	11	264	1006	8	1014	1278
22	59	1	60	238		238	298
23	1	ND	1	ND	1	1	2
24			0	9	1	10	10
25		1	1	5	2	7	8
26	3	ND	3	29	4	33	36
27	7		7	9	3	12	19
28	7	8	15	11	8	19	34
29	16	20	36	4	7	11	47
30	43	6	49	3	2	5	54
31	4	1	5	1	34	35	40
1 August	26	4	30		4	4	34
2	4		4	93		93	97
3	2		2		1	1	3
4	2	ND	2			0	2
5		3	3	8	5	13	16
6	3	4	7	1	4	5	12
7	2	6	8		1	1	9
8	3	1	4	2	2	4	8
9	12	23	35	28	29	57	92
10	6	4	10	2	150	152	162
11	15	9	24	16	14	30	54
12	15	5	20	20	11	31	51
13	18	2	20	1	3	4	24
14	9	4	13	1		1	14
15	4	4	8	4		4	12
16	9	10	19	1		1	20
17		21	21	3	32	35	56
18	1	7	8		2	2	10
19		12	12	1	16	17	29
20	10	29	39	2	2	4	43
21	3	22	25	5	58	63	88
22	12	26	38		18	18	56
23	9	10	19	5	8	13	32
24	56	ND	56	5	4	9	65
25	10	29	39	1	1	2	41
Total	3701	1033	4734	12558	2367	14925	19659

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A2.4. Daily catch of large (≥180 mm) least cisco by codend trap, Wood Bay, 1990.

Date	Number by station and side of trap ¹						Grand Total
	Station 503			Station 504			
	01	02	Total	01	02	Total	
1 July				84	11	95	95
2				62	8	70	195
3	111	14	125	25	14	39	73
4	26	8	34	15	12	27	117
5	80	10	90	71	10	81	162
6	58	23	81	59	4	63	159
7	85	11	96	68	2	70	166
8	23	13	36	40	2	42	90
9	36	12	48	14	4	18	46
10	26	2	28	14	4	18	99
11	19	14	33	54	12	66	17
12	17	ND	17	ND	ND	ND	17
13	16	ND	16	34	30	64	80
14	5	23	28	6	20	26	54
15	5	6	11	30	8	38	49
16	10	7	17	15	9	24	41
17	15	17	32	86	9	95	127
18	4	12	16	12	5	17	33
19	10	6	16	8	4	12	28
20	10	12	22	7		7	29
21	5	7	12	13	1	14	26
22	4	5	9	13	4	17	26
23	1	4	5	2	2	4	9
24		ND	0	ND	1	1	1
25	1	1	2	3	4	7	7
26	1	ND	1	2		2	4
27	1	4	5	5	3	8	9
28	1	5	6	2	4	6	12
29	1	2	3	5		5	8
30	5		5	2	3	5	10
31	3	6	9	1	4	5	14
1 August	1	1	2	1	1	2	4
2	1	5	6	2	3	5	11
3		1	1		1	1	2
4	1	ND	1			1	2
5	1	11	12		16	16	28
6	4	19	23	1	12	13	36
7	16	42	58		16	16	74
8	34	83	117	1	14	15	132
9	14	42	56	10	25	35	91
10	29	17	46	82	70	152	198
11	17	14	31	28	8	36	67
12	7	2	9	22	8	30	39
13	3	19	22	3	21	24	46
14	3	28	31	3	15	18	49
15	23	41	64	7	19	26	90
16	2	32	34		8	9	43
17	2	52	54	1	7	7	61
18	4	26	30			0	30
19	8	20	28	1	6	7	35
20	14	39	53	13	18	31	84
21	9	29	38	4	60	64	102
22	10	32	42	3	129	132	174
23	51	42	93	4	116	120	213
24	21	ND	21	36	219	255	276
25	14	122	136	21	47	68	204
Total	868	943	1811	988	1032	2020	3831

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A2.5. Daily catch of broad whitefish by codend trap, Wood Bay, 1990.

Date	Number by station and side of trap ¹						Grand Total
	Station 503			Station 504			
	01	02	Total	01	02	Total	
1 July				20		20	20
2	37	5	42	25		25	67
3	51	13	64	26	7	33	97
4	17	15	32	25	3	28	60
5	29	5	34	34	6	40	74
6	26	9	35	26	6	32	67
7	25	28	53	21	8	29	82
8	33	7	40	25	10	35	75
9	42	44	86	24	31	55	141
10	81	23	104	37	12	49	153
11	46	ND	46	ND	ND	ND	46
12	30	ND	30	39	24	63	93
13	14	18	32	24	7	31	63
14	12	28	40	18	7	25	65
15	24	18	42	5	4	9	51
16	11	13	24	19	2	21	45
17	27	9	36	14	1	15	51
18	27	5	32	9	1	10	42
19	87	9	96	17		17	113
20	34	3	37	39	4	43	80
21	37		37	31	5	36	73
22	12	12	24	21	6	27	51
23	4	ND	4	ND	5	5	9
24	2	4	6	13	2	15	21
25	6	5	11	13	3	16	27
26	4	ND	4	4		4	8
27	5	1	6	4	2	6	12
28	6	3	9	2	7	9	18
29	1	2	3		3	3	6
30	4	16	20	2	6	8	28
31	5	17	22	6	6	12	34
1 August	4	5	9	2	25	27	36
2	3	7	10	1	12	13	23
3	2		2	4		4	11
4		ND	0	1		1	2
5		3	3		5	5	8
6		2	2		3	3	5
7	4	4	8		3	3	11
8		6	6	1	4	5	11
9		2	2	3	5	8	10
10			0	3	1	4	7
11	3	3	6	1	10	11	17
12	6	40	46	12	34	46	92
13	2	17	19		14	14	33
14	2	17	19		9	9	28
15	3	10	13	6	3	9	22
16	4	8	12	7	6	13	25
17	1	23	24	9	16	25	49
18	1	10	11	2	3	5	16
19	1	1	2	5	3	8	10
20		4	4	1	1	2	6
21			0		3	3	3
22			0	1	6	7	7
23			0		11	11	11
24	3	ND	3		21	21	24
25		13	13	2	4	6	19
Total	778	492	1270	594	385	979	2249

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A2.6. Daily catch of lake whitefish by codend trap, Wood Bay, 1990.

Date	Number by station and side of trap ¹						Grand Total
	Station 503			Station 504			
	01	02	Total	01	02	Total	
1 July				27		27	27
2	84	2	86	27	1	28	114
3	28	16	44	18	5	23	67
4	10	7	17	4	3	7	24
5	26	8	34	30	1	31	65
6	27	8	35	34	1	35	70
7	26	4	30	47	3	50	80
8	34	12	46	34	7	41	87
9	65	39	104	41	34	75	179
10	29	27	56	34	13	47	103
11	29	ND	29	ND	ND	ND	29
12	14	ND	14	48	55	103	117
13	12	16	28	28	20	48	76
14	11	44	55	24	12	36	91
15	27	23	50	4	4	8	58
16	12	15	27	15	3	18	45
17	31	5	36	8	5	13	49
18	26	10	36	7	7	14	50
19	75	10	85	18	7	25	110
20	100	10	110	34	1	35	145
21	134	13	147	76	14	90	237
22	26	14	40	42	33	75	115
23	6	ND	6	ND	30	30	36
24	4	3	7	64	30	94	101
25	1	5	6	38	34	72	78
26	12	ND	12	30	18	48	60
27	8	11	19	15	42	57	76
28	18	13	31	4	27	31	62
29	9	19	28	8	21	29	57
30	16	19	35	5	19	24	59
31	6	16	22	8	25	33	55
1 August	15	39	54	10	57	67	121
2	23	30	53	6	36	42	95
3	17	14	31	4	39	43	74
4	13	ND	13	5	9	14	27
5	7	12	19	41	29	70	89
6	11	16	27	10	20	30	57
7	20	19	39	2	39	41	80
8	22	40	62	6	19	25	87
9	12	16	28	3	36	39	67
10	5	20	25	9	22	31	56
11	11	19	30	18	29	47	77
12	47	52	99	41	55	96	195
13	37	49	86	31	57	88	174
14	14	59	73	17	32	49	122
15	20	40	60	12	20	32	92
16	12	32	44	7	7	14	58
17	5	60	65	6	20	26	91
18	4	54	58	3	31	34	92
19	33	82	115	11	38	49	164
20	53	108	161	4	58	62	223
21	9	16	25	6	100	106	131
22	6	20	26	12	126	138	164
23	15	24	39	2	67	69	108
24	10	ND	10	12	68	80	90
25	17	57	74	3	38	41	115
Total	1344	1247	2591	1053	1527	2580	5171

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A2.7. Daily catch of inconnu by codend trap, Wood Bay, 1990.

Date	Number by station and side of trap ¹						Grand Total
	Station 503			Station 504			
	01	02	Total	01	02	Total	
1 July				1	1	2	2
2	7	3	10				11
3	5	13	18	2	4	6	24
4	2	3	5	1	2	3	8
5	1	1	2		1	1	3
6	1	4	5	2		2	7
7	1		1	5		5	6
8	2	2	4	7	3	10	14
9	4	3	7	14	6	20	27
10	6	4	10	11	5	16	26
11	5	ND	5	ND	ND	ND	5
12	3	ND	3	7	25	32	35
13	6	12	18	10	8	18	36
14	11	4	15	6	6	12	27
15	2		2	20		20	22
16	5	4	9	2	2	4	13
17	1	2	3				5
18	2	3	5	3	2	5	10
19		2	2	1	7	8	10
20	2	2	4	3	1	4	8
21	8	2	10	1	2	3	13
22	1	7	8	1	9	10	18
23	4	ND	4	ND	10	10	14
24	3	4	7	4	12	16	23
25	2		2	2	8	10	12
26	8	ND	8	7	6	13	21
27	6	4	10	7	7	14	24
28	5		5	4	8	12	17
29	5	10	15	2	7	9	24
30	7	6	13	3	4	7	20
31	4	10	14	2	8	10	24
1 August	11	9	20	5	18	23	43
2	2	5	7		13	13	20
3	1	10	11	1	2	3	14
4	6	ND	6		2	2	8
5	1	12	13		1	1	14
6	2	4	6		3	3	9
7	4	8	12	1	4	5	17
8	1	4	5		2	2	7
9		2	2			0	2
10			0	1	1	2	3
11	1	2	3	2	2	4	7
12	4	3	7	4	7	11	18
13	2	3	5	3	2	5	10
14	2	3	5	2	3	5	10
15	1	2	3			0	3
16		3	3		1	1	4
17	1	1	2	1		0	4
18			0			0	2
19		3	3		2	2	5
20	1	3	4	1	6	7	11
21		1	1		3	3	4
22	2	2	4		5	5	9
23	1	1	2	2	4	6	9
24	2	ND	2		4	4	6
25		4	4	1	5	6	10
Total	164	190	354	125	264	389	743

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A2.8. Daily catch of Arctic flounder by codend trap, Wood Bay, 1990.

Date	Number by station and side of trap ¹						Grand Total
	Station 503			Station 504			
	01	02	Total	01	02	Total	
1 July				105	238	343	343
2	47	55	102	42	721	763	865
3	308	284	592	36	1802	1838	2430
4	132	597	729	27	213	240	969
5	157	995	1152	41	830	871	2023
6	190	620	810	27	388	415	1225
7	342	439	781	241	260	501	1282
8	136	408	544	65	433	498	1042
9	34	55	89	52	71	123	212
10	320	102	422	24	200	224	646
11	166	ND	166	ND	ND	ND	166
12	77	ND	77	90	1047	1137	1214
13	20	325	345	52	37	89	434
14	31	89	120	185	1598	1783	1903
15	188	513	701	147	1803	1950	2651
16	110	704	814	131	430	561	1375
17	784	759	1543	467	144	611	2154
18	990	759	1749	2848	698	3546	5295
19	619	111	730	477	156	633	1363
20	385	210	595	531	193	724	1319
21	124	188	312	167	140	307	619
22	278	109	387	19	17	36	423
23	12	ND	12	ND	4	4	16
24	30	51	81	9	3	12	93
25	8	22	30	6	2	8	38
26	4	ND	4	58	2	60	64
27	18	17	35	156	15	171	206
28	4	4	8	225	28	253	261
29	57	31	88	245	18	263	351
30	119	57	176	3643	637	4280	4456
31	78	40	118	1088	207	1295	1413
1 August	2	18	20	133	45	178	198
2	24	8	32	20	5	25	57
3	38	8	46	5	6	11	57
4	8	ND	8		1	1	9
5	6	21	27			0	27
6	42	42	84		4	4	88
7	31	33	64			0	64
8	10	14	24	11	77	88	112
9	69	492	561	26	195	221	782
10	57	268	325	61	96	157	482
11	79	149	228	117	29	146	374
12	45	40	85	106	48	154	239
13	18	26	44	21	9	30	74
14	17	23	40	10	2	12	52
15	19	10	29	2	15	17	46
16	18	53	71	2	7	9	80
17	25	125	150	15	40	55	205
18	57	211	268	12	34	46	314
19	64	69	133	15	26	41	174
20	42	45	87	22	6	28	115
21	2	14	16	51	1	52	68
22		4	4	23	4	27	31
23	17	7	24	10		10	34
24	24	ND	24	9		9	33
25		2	2	2		2	4
Total	6482	9226	15708	11877	12985	24862	40570

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A2.9. Daily catch of Fourhorn sculpin by codend trap, Wood Bay, 1990.

Date	Number by station and side of trap ¹						Grand Total
	Station 503			Station 504			
	01	02	Total	01	02	Total	
1 July				1		1	1
2	7	5	12		3	3	15
3	38	23	61		4	4	65
4	32	15	47	4	7	11	58
5	16	14	30	9	9	18	48
6	11	32	43	5	10	15	58
7	5	34	39	6	3	9	48
8	8	21	29	15	1	16	45
9	20	26	46	13	7	20	66
10	12	9	21	7		7	28
11	10	ND	10	ND	ND	ND	10
12	30	ND	30	17	100	117	147
13	14		14	17	9	26	40
14	12	4	16	30	27	57	73
15	10	16	26	98	75	173	199
16	7	18	25	84	51	135	160
17	7	19	26	64	17	81	107
18	4	11	15	58	2	60	75
19	1	7	8	54	2	56	64
20		1	1	20	2	22	23
21		3	3	39	1	40	43
22	32	6	38	22	1	23	61
23	8	ND	8	ND	5	5	13
24	7	3	10	27	1	28	38
25	8	7	15	5	2	7	21
26	10	ND	10	14	2	16	26
27	7	11	18	20	5	25	43
28		3	3	49	4	53	56
29	4	8	12	40	6	46	58
30	11	6	17	45	3	48	65
31	7	10	17	19	4	23	40
1 August	21	9	30	17	22	39	69
2	11	7	18	8	5	13	31
3	42	10	52	2	4	6	58
4	12	ND	12	3		3	15
5	13	6	19	1	2	3	21
6	38	19	57		1	1	58
7	36	17	53		2	2	55
8	14	12	26	3	1	4	30
9	9	9	18	4	4	8	26
10	12	15	27	2	4	6	33
11	3	7	10	3	1	4	14
12	9	1	10	10	4	14	24
13	9	9	18	14	4	18	36
14	12	1	13	10	4	14	27
15	21	7	28	4	6	10	38
16	11	5	16	6		6	22
17	10	3	13	3	1	4	17
18	21	23	44	6	4	10	54
19	24	25	49	3	3	6	55
20	66	38	104	17	11	28	132
21	9	8	17	27	4	31	48
22	17	12	29	16	9	25	54
23	35	6	41	14	1	15	56
24	66	ND	66	40	3	43	109
25	39	7	46	15	8	23	69
Total	898	568	1466	1010	469	1479	2945

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A2.10. Daily catch of rainbow smelt by codend trap, Wood Bay, 1990.

Date	Number by station and side of trap ¹						Grand Total
	Station 503			Station 504			
	01	02	Total	01	02	Total	
1 July							35
2					10	10	35
3	29	10	39		5	5	63
4	13	110	123		23	23	149
5	2	3	5		1	1	6
6	3	4	7		3	3	10
7	42	9	51	6		6	57
8	25	15	40	10	3	13	53
9	5	36	41	11	5	16	57
10	45	16	61	8	1	9	70
11	21	11	32	10	8	18	50
12	141	ND	141	ND	ND	ND	141
13	646	ND	646	8	30	38	684
14	75	270	345	13	2	15	360
15	416	145	561	7	8	15	576
16	194	30	224	1	3	4	228
17	32	6	38	4	1	5	43
18	24	5	29			0	29
19	20	6	26	1	2	3	29
20	7		7	2	2	4	11
21	11	1	12	6		6	18
22	41	4	45	4	4	8	53
23	1216	425	1641	5		5	1646
24	85	ND	85	ND	1	1	86
25	671	338	1009	202	29	231	1240
26	674	979	1653	7	4	11	1664
27	99	ND	99	3		3	102
28	81	29	110	1		1	111
29	7	2	9			0	9
30	7	23	30	2		2	32
31	17	3	20	3	1	4	24
1 August	8	1	9			0	9
2	5	1	6			0	6
3	98	12	110			0	110
4	898	49	947	6	3	9	956
5	60	ND	60		3	3	63
6	97	76	173		8	8	181
7	10	40	50			0	50
8	7	18	25			0	25
9	3	2	5			0	5
10	2	1	3			0	3
11			0			0	0
12	9	5	14		1	1	15
13	203	29	232			0	232
14	126	45	171	20		20	191
15	65	20	85	4		4	89
16	19		19			0	19
17	1	5	6		1	1	7
18	1		1			0	1
19		2	2		2	2	4
20	28	113	141		2	2	143
21	1	1	2		1	1	3
22	13	19	32	13		13	45
23	221	23	244	108	1	109	353
24	946	ND	946	125	4	129	1075
25	23	2	25	8	1	9	34
Total	7493	2944	10437	645	173	818	11255

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A3.1. Daily trapnet catch of minor species at Station 503, Wood Bay, 1990.

Date	Number Captured by Species													Coregonid Hybrids	Total	
	LNSK	PCHR	SFCD	BLPB	STFL	NRPK	NSSB	ARCD	ARGR	CHAR	LAMP	RDWT	CPLN			BRBT
1 July																
2		1	2		3	4			2						4	16
3		6	4	1	30	1	7	1							4	54
4		4	5		14											23
5	1	47	8			1									4	61
6		26	20		8										2	56
7	1	3	15		6				1						1	27
8	5	1	48		2										2	58
9	1		3		7										2	13
10		1	11	13	7	2										34
11			5		1	13										19
12		2	6	2	13										28	51
13		20	9		19	3									1	52
14		4	29	1	28					1					6	69
15		3	16	2	18		1			1						41
16		1	30	1	7	1									6	46
17		5	4	1	2											15
18		1	3		11					1		1			3	19
19		4			1	2									1	8
20		4			1	1									3	9
21		4	1		8										4	17
22	2		2		41	5									7	57
23		1			7	2									1	11
24	1	3	3			5									2	15
25		7		3	9										2	21
26			7	6	2										2	17
27		2	10	12	3	2									1	30
28		5	4	4	5	2							1		6	27
29		8	3	5	2	1							1		13	33
30		9	4	4	5	2							1		1	27
31		1		19	9	2				2					1	36
1 Aug.		1	2												7	10
2		1	6		4	1									2	14
3		6	12	17	6					1					4	46
4			17	1												18
5			9	68	2	1										80
6	2	3	5	901	3	1		1					1		19	936
7			2	317	7										50	376
8			7	12	2										12	38
9			3	3	3					3			2		4	13
10			6		1										1	9
11		1	3												2	6
12			6	44	2			2							4	58
13			4	130	2										5	142
14	1	1	2	44	1			2						1	4	55
15		1	4	67				1		1					12	86
16			4	19	2										7	32
17		1	10												2	13
18			2	1	2										1	6
19		1	5	3	4										6	19
20			22	9	3			3							8	45
21			76	2	3											81
22			27		1										6	34
23			30	5	4										5	44
24			15	26	2								1		1	45
25			10	5									1		4	20
Total	24	189	541	1749	340	36	11	7	3	1	9	1	10	1	276	3188

Appendix A3.2. Daily trapnet catch of minor species at Station 504, Wood Bay, 1990.

Date	Number Captured by Species													Coregonid Hybrids	Total	
	LNSK	PCHR	SFCD	BLPB	STFL	NRPK	NSSB	ARCD	ARGR	CHAR	LAMP	RDWT	CPLN			BRBT
1 July		8			2	1									2	13
2		6			19	2									5	32
3		5			11	1										17
4	1	1			4				2							8
5		2			1	2									2	7
6	4	11			33										1	49
7		2			12		1		1						4	20
8	4		1		17	1									2	25
9	3				25										4	32
10	3	14	13		12	2									12	56
11																ND
12	2	20	74		42	3									5	146
13		3	11		10	4									6	34
14		2	38		16	1									3	60
15	1	2	10		9	3										25
16		29	5		3										1	38
17		3	1		7			1							2	14
18		1	4	2	8											15
19	1	9	1		4						1					16
20		113	1		5	1									1	121
21		10	2		4										2	18
22		1	3		8			1			1				7	21
23															2	2
24		2	8		2										7	19
25	3		5		9										5	22
26			5		10					1					3	19
27		1	7		3	3						2			4	20
28			13	1	4										6	24
29			15		5										4	24
30		1	8													9
31		4	1		3							1			5	14
1 Aug.		1	1		2										19	23
2		1	1		1										8	10
3		1	1	1											6	9
4	1		3	1	2										2	8
5		1			6										9	16
6	1	1													9	11
7		1								1					11	13
8					3										4	7
9		1			1										6	8
10		2	3		2		1								1	9
11			2		6										4	12
12			3		7							2			5	17
13			3		5				1						7	16
14			3		5										6	14
15			1		1										6	8
16					1											1
17			1		3											4
18					4											4
19					1										3	4
20			1		8										4	13
21			6		7										4	17
22			7		1										5	13
23			12		6										18	36
24			23		2					1					9	35
25			3												2	5
Total	24	258	300	4	362	24	2	0	5	1	3	2	5	0	243	1233

Appendix A4.1. Length-frequency distribution for measured sample of Arctic cisco by sampling cycle and side of trap at Station 503, Wood Bay, 1990.

Fork Length (mm)	Number by Sampling Cycle and Side of Trap ¹																Total	
	1		2		3		4		5		6		7		8			
	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02
0- 9																		
10- 19																		
20- 29																		
30- 39																		
40- 49																		
50- 59														1	1			1
60- 69														2	6	2	2	4
70- 79																		3
80- 89	1																	5
90- 99	8	9																11
100-109	20	14	1	9	14	6												37
110-119	7	4	2	3	11	5												25
120-129	5		1	1	6	3												19
130-139	8	2	4		7	2	1											26
140-149	13	7	2	5	15	4	4											37
150-159	20	2	6	2	14	3	3											51
160-169	4	1	1	1	6	4												18
170-179	1	1			3	1												17
180-189	3	3	1		3													14
190-199	1		1		3													12
200-209	6	1	2		2													18
210-219	1		3		2													11
220-229	4				1													8
230-239	4	1			1													10
240-249	5		1		1													13
250-259	3																	6
260-269	3	1	1	1	1													11
270-279		1			1													7
280-289	4				1													19
290-299	2		1		1													13
300-309	2	1			1													16
310-319	1				2													17
320-329	1	1			2	1	5	5	5	6	13	9						25
330-339	1	1	1		4	1	4	2	13	6	15	15	8					33
340-349	3		2	2	1													56
350-359	4	1	2	3	2	2	12	2	12	5	19	17	11	21	24	21		86
360-369	3		6	2	3	1	11	7	14	6	16	22	7	42	16	20		76
370-379	7		5	2	1		10	4	10	5	9	29	13	32	15	17		70
380-389	5		3	4	2	4	12	1	14	4	13	29	14	28	8	16		71
390-399	7	1	2		1		3	2	6	8	6	23	2	19	7	6		34
400-409	2		2	1	1		2	4	9	4	4	13	4	11	1	7		25
410-419	3	1			3		1	1	1	2	2	6		7				10
420-429	1				1		1	2	1	2	3		2	1	2			6
430-439					1		1	1	1	1								3
440-449					1													1
450-459																		
460-469																		1
470-479																		
480-489																		
490-499																		
Total	162	53	49	44	107	37	73	27	108	43	121	193	102	251	204	181	926	829

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A4.2. Length-frequency distribution for measured sample of Arctic cisco by sampling cycle and side of trap at Station 504, Wood Bay, 1990.

Fork Length (mm)	Number by Sampling Cycle and Side of Trap ¹																Total	
	1		2		3		4		5		6		7		8			
	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02
0- 9																		
10- 19																		
20- 29																		
30- 39																		
40- 49																		
50- 59																		
60- 69																		
70- 79																		
80- 89	4	1			1													5
90- 99	39	12			10	6												57
100-109	57	32			27	11												112
110-119	15	8			10	5												55
120-129	4	3			2	1												19
130-139	4	3			9	7												26
140-149	7	9			6	5												37
150-159	20	4			4	5												51
160-169	7	3			4	2												18
170-179	4	1			2	1												17
180-189	7				3	2												14
190-199	11	1			6	1												18
200-209	3	1			7	1												11
210-219	1				5	3												8
220-229	6				4													10
230-239	7	1			2	2												13
240-249	4				4													8
250-259	2				2													4
260-269	4	1			1													5
270-279	2				2													4
280-289	5				1	1												6
290-299	2				1	1												3
300-309	2	1			3	2												5
310-319	3				1	1												4
320-329	3	1			1	2												5
330-339	3				9	1												10
340-349	5				12	3												17
350-359	1				22	6												28
360-369	4				22	9												26
370-379	1				25	7												27
380-389	1	1			16	1												18
390-399	1				8	2												10
400-409	2				4													6
410-419	1				7													8
420-429																		
430-439																		
440-449																		
450-459																		
460-469																		
470-479																		
480-489																		
490-499																		
Total	240	83	245	92	233	41	283	59	139	43	106	207	82	121	376	319	1704	965

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A4.3. Length frequency distribution for measured sample of least cisco by sampling cycle and side of trap at Station 503, Wood Bay, 1990.

Fork Length (mm)	Number by Sampling Cycle and Side of Trap ¹										Total							
	1		2		3		4		5		6		7		8		Total	
	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02
0- 9																		
10- 19																		
20- 29																		
30- 39																		
40- 49																		
50- 59						1						2		1			2	2
60- 69										1	2		1	2	8	10	10	13
70- 79	1	2		2		2				1	3	2		6	6			12
80- 89	16	8	6	11	14	9	4		2	2								42
90- 99	23	22	13	24	32	26	9		15	7								92
100-109	3	9	8	8	15	14	8	1	25	13		3	4	7	4		4	69
110-119	2	4			6	4	3	1	10	2		8	11	8	8		1	38
120-129	3	4	4	3	2	1	2	1	3	1			5	1	3	2	3	17
130-139	12	10	14	2	18	12	3	2			1	2	2	2	3	1	1	52
140-149	23	18	21	11	18	11	2	1	4	1	4	8	6	2			10	78
150-159	8	9	23	4	19	6	5	1	7	1	11	7	11	9	9	24		93
160-169	17	4	11	3	9	4	3	1	1	1	7	5	10	8	10	20		68
170-179	18	7	9	2	4	4			1		6	5	6	3	4	7		47
180-189	31	7	11	4	12	2	1		3	1	4	1	3	1	3	7		68
190-199	17	7	15	6	8	6	1	1	2		5	8	2				8	58
200-209	12	6	3	5	7	2	1				8	4		2	5	3		36
210-219	11	1	4		7	2		2		1	9	1	4	3	6	9		41
220-229	7	2	5	1	3	3	1				4	4	1	1	3	2		24
230-239	2	2	5	3	4	2					3	3	1	1	1			15
240-249	4	3	6	7	3	3		1	1		2	3	1	2	4	4		21
250-259	6	3	4	2	1	1			1		5	5		2	3	4		19
260-269	6	4	3	3	2	3		1			4	3	1	3	6	4		22
270-279	4	3	4	6	1	6	1				5	3	3	7	4	7		22
280-289	9	5	2	3		3					5	14	1	10	4	8		21
290-299	4	7	3	2	4	2			2	1	3	6	3	9	9	6		28
300-309	3	2	4	1	1	1			2	1	1	5	11	9	8	9		22
310-319	3	2	6	2	2		1	2		2	9	8	8	14	7	10		36
320-329	5	2	4	2	1	5	1		1	1	3	10	7	20	3	13		25
330-339	1	4	2	3	1	7		1	1	2	7	8	4	12	9	14		25
340-349	1	3			6	1			1		2	13	3	12	3	12		10
350-359			2		4				1	3	7	3	3	7	5	3		16
360-369	1		1	2	1	5			1	3	1	5					4	8
370-379					1						1	6	1	5				2
380-389					1						1			2				
390-399					1													1
400-409											1							1
Total	253	160	191	124	197	157	48	19	80	46	133	169	101	174	139	213	1142	1062

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A4.4. Length-frequency distribution for measured sample of least cisco by sampling cycle and side of trap at Station 504, Wood Bay, 1990.

Fork Length (mm)	Number by Sampling Cycle and Side of Trap ¹										Total							
	1		2		3		4		5		6		7		8		Total	
	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02
0- 9																		
10- 19																		
20- 29																		
30- 39																		
40- 49																		
50- 59																		
60- 69																		
70- 79	1	4																
80- 89	20	25	5	11	11	15	4											
90- 99	37	68	23	22	29	30	14	2	1	7								
100-109	10	11	8	15	19	21	10	5	5	16	3	12		9		1		55
110-119	2	2	3	3	5	7	4	3		3	5	12		4		1		17
120-129	3	5	2	5	3	5	2			4	6	3		4		2		19
130-139	13	25	16	15	8	12	9	1		1		3	2		3			48
140-149	19	14	27	23	30	15	16	2	1		6	5	6	1	1	6		106
150-159	16	8	13	17	22	2	10	2	1		6	7	6	4	18			74
160-169	11	6	10	5	5	1	1	1	1	1	7	14	7	3	3	15		45
170-179	9	5	13	4	7	4	1				8	7	5	2	4	3		47
180-189	29	11	24	7	20	4	2	2	1		6	9	2	3	2	6		86
190-199	15	9	20	3	15	8	1				8	9	6		3	2		68
200-209	27	5	12	6	11	2			1		4	4	7	2	3	6		65
210-219	15	5	8	7	7	2			1		6	7	3	2	1	1		40
220-229	15	1	8	3	5				1		8	9	6	2	1	2		44
230-239	4	4	2	2	1	2	3				5	2	2	1	1			18
240-249	5	2	1	1	2		1				2	6	4	2	2	1		17
250-259	5	3	5	8	6	1	3			1	2	1			1			22
260-269	3	3	4	5	4		1	1	1		3	5			2	2		18
270-279	5	4	3	3	5		1	1	1		4	1			3	5		19
280-289	5	8	4	3	3	2	1	2	1	1	4	2		6	4	7		22
290-299	3	7	2	5	1	1	1		1		2	4		6	6	2		16
300-309	3	2	4	2	3		3	2	2		2	9	1	2	13	13		23
310-319	1	2	1	2	1	1	1	1		2	6	1	4	3	16			7
320-329	2	2	1	1	2	1	2	1	1	1	7	1	5	4	15			13
330-339	3	3	2	2	2	2	1	1		2	10	14	3	8				9
340-349	2	2	1	2	3	1	1		1		6	10	8	18				14
350-359			2	2	1		1		1		1	4	1	7	5	13		9
360-369	1		2	1	3		2		2		4	6	1	4				3
370-379			1		1				1		4	4		2				1
380-389					1													1
390-399																		1
400-409																		2
410-419																		
420-429																		
430-439																		1
440-449																		1
Total	277	246	221	185	228	139	95	34	20	45	106	176	64	104	75	179	1086	1108

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A4.5. Length-frequency distribution for measured sample of broad whitefish by sampling cycle and side of trap at Station 503, Wood Bay, 1990.

Fork Length (mm)	Number by Sampling Cycle and Side of Trap ¹								Total									
	1	2	3	4	5	6	7	8										
0-9																		
10-19																		
20-29																		
30-39																		
40-49																		
50-59			13	7	2	1		2	21									
60-69			29	2	3	2		2	38									
70-79			2			4	2		9									
80-89		1						1	10									
90-99	19		4					2	25									
100-109	12	1	6					1	20									
110-119	3		3						6									
120-129	5		1						6									
130-139	2		3					1	6									
140-149	7	1	2		2			1	12									
150-159	4		1		2			1	8									
160-169	3	1	2		4	1	1	1	12									
170-179	1				4				5									
180-189	2	1	3		2			1	9									
190-199					1				1									
200-209	2		3		1				6									
210-219	2		4	1				1	7									
220-229			5	2	5				12									
230-239	5		12	1	4	3			22									
240-249	10		9	6	3	3			22									
250-259	1	1	3	2	3	2			10									
260-269	6		3						9									
270-279			1					2	3									
280-289	1	2	1					1	5									
290-299	2		4					3	9									
300-309	1	1	1	4	2	1	1	1	11									
310-319	3	2	3	1	5	3	2	1	18									
320-329	5	1	4	3	3	3			13									
330-339	3		10	3	7	1	1	2	22									
340-349	9	3	8	1	3	1	1	4	22									
350-359	6	5	4	6	2	3	3	1	25									
360-369	6	3	4	3	3	1	1	1	14									
370-379	3	3	5	4	2	1	1	4	11									
380-389	5		3	7	1	2	2	1	12									
390-399	3	2	6	1	1	2	1	1	14									
400-409	1	1	1	4				1	8									
410-419	1	1	1	3	2	1	1	6	14									
420-429	3	1	1	3	2	1	1	4	14									
430-439	3	3	2	2	1	4	1	1	15									
440-449	2	3	2	3	1	2	1	1	15									
450-459	3	2	2	1	1	1	2	1	11									
460-469		5	4	1	1				11									
470-479	3	1	1	1	1			1	7									
480-489	1	3	2	2	1	2		2	12									
490-499	1	3	2	2	3			2	11									
500-509	3	3	6		2			1	16									
510-519	1	3		1	1			1	6									
520-529	2	1	2						5									
530-539		2			1				3									
540-549		1			2			1	3									
550-559			2			1	1	1	5									
560-569	1				1			1	3									
570-579								1	1									
580-589		1			1				2									
590-599									1									
600-609									1									
610-619									1									
620-629									1									
Total	161	63	130	81	1/2	56	39	27	19	52	7	20	19	107	4	12	551	418

¹Side 01 refers to the Anderson River side of the lead.

Appendix A4.6. Length-frequency distribution for measured sample of broad whitefish by sampling cycle and side of trap at Station 504, Wood Bay, 1990.

Fork Length (mm)	Number by Sampling Cycle and Side of Trap ¹								Total									
	1	2	3	4	5	6	7	8										
0-9																		
10-19																		
20-29																		
30-39																		
40-49																		
50-59						8			8									
60-69						38	1		39									
70-79						2	1	3	6									
80-89	14					1			15									
90-99	17	5		1		3	2	1	27									
100-109	12	2		6	5	11	2	5	33									
110-119	6			4	3	7			20									
120-129	6			6	2	2	1		17									
130-139	11			4		3			19									
140-149	5			1	1	8	1		16									
150-159	6			1		1	1		9									
160-169	4	1		3		1			9									
170-179	3	1		3		1			8									
180-189	2					2	1		5									
190-199	1					3			4									
200-209						2			2									
210-219						6	2	2	10									
220-229	1					6	1		8									
230-239	1					6	3		10									
240-249	5					10	2	1	18									
250-259	1					4	4		9									
260-269	2	1				1			4									
270-279						1		1	2									
280-289	1					4		2	7									
290-299	2					2			4									
300-309	2					4	1		7									
310-319	4					2	2	1	9									
320-329	1					1	1	1	3									
330-339	1					3	1		5									
340-349	1	1				7	1		9									
350-359	6					5	2	2	15									
360-369	1					7	4	1	13									
370-379	3	3				4	1	1	8									
380-389	3					5	1	2	11									
390-399						3	4	2	9									
400-409	2					2	4	1	7									
410-419	1					1	1	1	3									
420-429	1	2				3	2	6	12									
430-439	1					2	3	2	6									
440-449	1	1				4	4	1	10									
450-459						2	4	4	10									
460-469		2				1	6	2	10									
470-479						1	2	1	4									
480-489						4	3	1	8									
490-499						1	4	3	8									
500-509	1	2				2	2	1	6									
510-519	1	1				2	2	1	5									
520-529						2	2	2	6									
530-539						2	1	1	4									
540-549						1	1	1	3									
550-559						2	1	1	4									
560-569						1		1	2									
570-579						1		1	2									
580-589								1	1									
590-599								1	1									
600-609								1	1									
610-619								1	1									
620-629								1	1									
Total	127	32	138	81	108	17	57	24	6	56	8	31	36	70	8	49	488	360

¹Side 01 refers to the Anderson River side of the lead.

Appendix A4.7. Length-frequency distribution for measured sample of lake whitefish by sampling cycle and side of trap at Station 503, Wood Bay, 1990.

Fork Length (mm)	Number by Sampling Cycle and Side of Trap ¹																Total	
	1		2		3		4		5		6		7		8			
	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02		
0- 9																		
10- 19																		
20- 29																		
30- 39																		
40- 49																		
50- 59																		
60- 69																		
70- 79	1															1	1	
80- 89	2																4	
90- 99	2																39	
100-109	2																65	
110-119	3																51	
120-129	3																21	
130-139	11	1															35	
140-149	10	3															40	
150-159	5																44	
160-169	11	1															43	
170-179	9	1															29	
180-189	7	1															26	
190-199	5	1															26	
200-209	5	1															26	
210-219	4																23	
220-229	6	5															25	
230-239	2	4															15	
240-249	1	3															12	
250-259	3	4															14	
260-269	4	1															13	
270-279	3	2															14	
280-289	2	2															11	
290-299	2	2															15	
300-309	2	5															16	
310-319	2	2															17	
320-329	6	1															11	
330-339	2	2															11	
340-349	2	2															14	
350-359	1	2															6	
360-369																	13	
370-379	2	4															15	
380-389	3	4															31	
390-399	3	3															41	
400-409	6	7															37	
410-419	4	6															39	
420-429	2	2															23	
430-439	2	3															31	
440-449	1	4															18	
450-459	2	1															12	
460-469	1	4															9	
470-479		1															10	
480-489																	4	
490-499	1																2	
500-509																	3	
510-519																	1	
520-529																	1	
530-539																	1	
540-549																		
Total	144	43	107	88	220	85	75	47	98	109	87	122	118	163	90	132	939	789

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A4.8. Length-frequency distribution for measured sample of lake whitefish by sampling cycle and side of trap at Station 504, Wood Bay, 1990.

Fork Length (mm)	Number by Sampling Cycle and Side of Trap ¹																Total	
	1		2		3		4		5		6		7		8			
	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02		
0- 9																		
10- 19																		
20- 29																		
30- 39																		
40- 49																		
50- 59																		
60- 69																	1	
70- 79																	1	
80- 89	2																3	
90- 99																	19	
100-109																	58	
110-119	1																31	
120-129	4																26	
130-139	5	1															32	
140-149	15																49	
150-159	10	1															33	
160-169	6																29	
170-179	8																24	
180-189	11																25	
190-199	10																26	
200-209	2	2															19	
210-219	9	1															15	
220-229	7	6															16	
230-239	8	5															25	
240-249	5	1															18	
250-259	1	2															14	
260-269	3	3															14	
270-279	3	1															21	
280-289	2	3															13	
290-299	1	2															13	
300-309	2	1															7	
310-319																	17	
320-329	1	2															11	
330-339	1	2															9	
340-349																	4	
350-359	1																8	
360-369																	9	
370-379	3	4															21	
380-389	1	4															24	
390-399	4	1															41	
400-409	2	8															32	
410-419	2	8															36	
420-429	4	5															34	
430-439	7	2															29	
440-449	4	4															12	
450-459	2	1															8	
460-469																	1	
470-479	1	1															4	
480-489																	1	
490-499	1																3	
500-509																	1	
510-519																	1	
520-529																	1	
530-539																	1	
540-549																		
Total	144	15	136	98	121	41	158	158	46	139	68	148	102	138	45	150	820	887

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A4.9. Length-frequency distribution for measured sample of inconnu by sampling cycle and side of trap at Station 503, Wood Bay, 1990.

Fork Length (mm)	Number by Sampling Cycle and Side of Trap ¹																Total		
	1		2		3		4		5		6		7		8				
	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02	
0- 24																			
25- 49																			
50- 74					3					1							3	2	
75- 99																1		1	
100- 124															1			1	
125- 149	2		8	3	6	2	3	1									4	19	10
150- 174	3		4	3	6	2	6	2	9	7							8	29	22
175- 199	1		1		1	1	1	7	3	1	3						3	10	9
200- 224	1																1	1	2
225- 249	1	2	2	3	1			1	1	1							2	5	9
250- 274	1							3										3	5
275- 299									1	2	1						1	5	2
300- 324	1		5	1														7	3
325- 349			4					2	2	4	2						3	11	9
350- 374								1										2	2
375- 399			1														1	1	2
400- 424					1			1	1	1	3						3	5	4
425- 449																		2	6
450- 474					1			1	1	1	2						1	1	6
475- 499			1		1			1	1	1	2						1	1	6
500- 524	1	5	1															1	6
525- 549	3	4			3			2	1	2							3	7	17
550- 574	1		2					1	1	2	2						2	7	10
575- 599	5		2														1	3	14
600- 624																		1	8
625- 649																		1	5
650- 674	1																	1	5
675- 699																		1	1
700- 724	1																	1	1
725- 749	1				1			1			2						1	4	3
750- 774	1	1																1	1
775- 799																	3	1	1
800- 824																		3	3
825- 849																		1	1
850- 874	1		1															1	2
875- 899			1														1	2	1
900- 924																		1	1
925- 949			1															1	1
950- 974																		1	1
975- 999			1															3	3
1000-1024																		1	1
1025-1049																		1	1
1050-1074					1													1	1
1075-1099																		1	1
1100-1124																		1	1
1125-1149																		1	1
1150-1174																		1	1
1175-1199																		1	1
Total	17	21	34	21	17	13	25	17	33	45	8	32	10	15	5	14	149	178	

¹ Side 01 refers to the Anderson River side of the lead.

Appendix A4.10. Length-frequency distribution for measured sample of inconnu by sampling cycle and side of trap at Station 504, Wood Bay, 1990.

Fork Length (mm)	Number by Sampling Cycle and Side of Trap ¹																Total		
	1		2		3		4		5		6		7		8				
	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02	01	02	
0- 24																			
25- 49																			
50- 74																			
75- 99																			
100- 124																			
125- 149	4	1	19	12	2	15	2	4	1	3								28	36
150- 174	1		13	10	5	8	2	7	5	8								26	33
175- 199			1	1	1	1			1	2								3	6
200- 224			1	1	1	1			1	1								2	3
225- 249	1	1	2	6	1	1			1	1								4	11
250- 274	1		1	2	1	1			1	1								2	4
275- 299																			
300- 324	1		1															2	4
325- 349																		3	4
350- 374																		2	2
375- 399																		1	5
400- 424																		1	6
425- 449	2																	2	7
450- 474																		1	5
475- 499	1	1	1															4	6
500- 524	1		3	2														7	8
525- 549	1		4	1														4	22
550- 574	1		2															1	7
575- 599	1																	1	7
600- 624																		2	5
625- 649	1	2	1															1	8
650- 674			1															3	10
675- 699																		1	4
700- 724																		2	7
725- 749																		1	1
750- 774																		2	3
775- 799																		1	3
800- 824																		1	3
825- 849																		1	3
850- 874	1		1															3	5
875- 899			1															1	2
900- 924																		2	5
925- 949			1															1	2
950- 974																		1	2
975- 999			1															1	2
1000-1024																		1	2
1025-1049			1															1	2
1050-1074																		1	1
1075-1099																		1	1
1100-1124																		1	1
1125-1149																		1	1
1150-1174																		1	1
1175-1199																		1	2
Total	9	10	54	48	10	29	13	58	13	54	4	13	10	12	4	27	117	251	

¹ Side 01 refers to the Anderson River side of the lead.